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Date: December 20, 2010 Signature: _____
Sanro Zlobec, Reg. No. 52,535

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: U.S. Patent Application of Dominique GAUTHIER *et al.*

Serial No. 10/644,932 Group Art Unit: 2416

Filed: August 21, 2003 Examiner: Wanda Z. RUSSELL

Title: METHOD AND SYSTEM OF HANDOFF

APPEAL BRIEF UNDER 37 CFR §41.37

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Further to the Notice of Appeal filed September 20, 2010, submitted herewith is an Appeal Brief in accordance with 37 CFR §41.37. The fee for filing a brief in support of an appeal as set forth in 37 CFR §41.20(b)(2) is also being submitted herewith, together with a petition for extension of time under 37 CFR §1.136(a). An amendment under 37 CFR §1.116 is also being submitted concurrently herewith under separate cover.

If any further fees are due, the Director is hereby authorized to debit the required amount from deposit account no. 19-2550 and to advise Applicants' agent accordingly.

TABLE OF CONTENTS

I. 37 CFR §41.37 (c)(1)(i) - Real Party in Interest

The real party in interest is the assignee of the entire interest in the present U.S. patent application, namely Bell Mobility Inc.

II. 37 CFR §41.37 (c)(1)(ii) - Related Appeals and Interferences

Applicants believe that there are no related appeals or interferences.

III. 37 CFR §41.37 (c)(1)(iii) - Status of the Claims

Claims 1-24, 27, 30-32 and 34-40 are rejected.

Claims 25, 26, 28 and 33 are cancelled.

IV. 37 CFR §41.37 (c)(1)(iv) - Status of Amendments

There have been no amendments to the claims since May 7, 2009, the date on which Applicants filed a response to the Office Action mailed February 12, 2009.

An amendment to correct three (3) occurrences of a typographical error in the specification was filed on December 20, 2010. It is unknown to Applicants whether this amendment has been entered.

V. 37 CFR §41.37 (c)(1)(v) - Summary of Claimed Subject Matter

As a preliminary remark, it will be noted that the claims deal with a scenario in which a subscriber station is migrating from a "second coverage area" to a "first coverage area". Equivalently, one can interpret this as migrating from a "pre-handoff coverage area" to a "post-handoff coverage area". However, upon reading the detailed description, one will come across many occasions in which the expression "first coverage area" is used in the context of describing the pre-handoff coverage area (rather than the post-handoff coverage area). Similarly, the detailed description frequently employs the expression "second coverage area" in the context of describing the post-handoff coverage area (rather than the pre-handoff coverage area).

Applicants acknowledge that this discrepancy, namely between what is designated by the terms "first" and "second" in the claims vis-à-vis what is designated by the terms "first" and "second" in the detailed description, can be confusing at times. In fact, Applicants themselves have recently discovered a typographical error in the specification related to this precise issue and, in order to prevent future confusion, have proceeded to correct this error by way of an amendment filed December 20, 2010. Nevertheless, Applicants wish to point out that this seemingly reverse usage of the terms "first" and "second" is nor inconsistent, nor incorrect, nor beyond a reasonable use of the terms "first" and "second" in a given claim. In particular, the terms "first" and "second" are employed as claim nomenclature merely to distinguish between countable entities rather than to impose a given order or sequence. Moreover, the specification and drawings as originally filed support a correspondence between what is claimed as "first" but described as "second", and between what is claimed as "second" but described as "first" (see, for example, ¶ [0043], line 2, ¶ [0049], lines 6-9, ¶ [0050], lines 5-11 as well as Fig. 7, and the summary of the invention and the claims as originally filed).

With the above in mind, Applicants present the following summary of the claimed subject matter, with reference to paragraphs and line numbers in the patent application publication (2005/0041621, published February 24, 2005). It is to be noted that in the following, any association between claim language and the specification/drawings

serves merely as a guide to facilitate understanding and is not to be considered limiting.

Claim 1

CLAIM LANGUAGE	REFERENCE IN APPLICATION AS PUBLISHED
A device	Symbol #58 in the drawings.
for integration into a base station of a type that includes	Symbol #38 in the drawings; paragraph [0032], lines 3-4; paragraph [0032], line 7; paragraph [0034], lines 3-4; paragraph [0035], line 2; paragraph [0047], lines 3-5; paragraph [0059], lines 1-9.
at least one radio-transceiver for receiving and transmitting radio communications to a plurality of subscriber stations; the device comprising:	Symbol #62 in the drawings; paragraph [0035], lines 8-9; paragraph [0035], line 11; paragraph [0036], lines 1-3.
an input device configured to be coupled to the at least one radio-transceiver for	input end of Symbol #82 in the drawings; paragraph [0039], line 4.
receiving a handoff signal from the at least one radio-transceiver	Symbol #66 in the drawings; paragraph [0035], line 10; paragraph [0035], line 11; paragraph [0035], line 12; paragraph [0035], lines 13-21; paragraph [0039], line 17; paragraph [0045], lines 1-4.
at a first mode	Symbol F2 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9.
respective to a first coverage area of the communication system;	Symbol #50 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
an output device for delivering the handoff signal	Symbol #90 in the drawings; paragraph [0037], lines 4-9; paragraph [0042], line 1; paragraph [0045], lines 15-16; paragraph [0049], lines 1-2.
at a second mode	Symbol F1 in the drawings; paragraph [0032], lines 3-4; paragraph [0035], line 11; paragraph [0039], line 17; paragraph [0049], lines 7-9.
respective to a second coverage area;	Symbol #46 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
a converter coupled to said input device and said output device	Symbols #82 and #86 in the drawings; paragraph [0035], line 12; paragraph [0037], line 1; paragraph [0039], line 1; paragraph [0039], line 4; paragraph [0040], lines 8-10; paragraph [0058], lines 1-5.
for translating the handoff signal from the first mode into the second mode;	Paragraph [0037], line 1; Paragraph [0037], line 3; paragraph [0040], lines 4-5; paragraph [0043], line 2; paragraph [0045],

	lines 10-11, paragraph [0049], lines 7-9; paragraph [0058], lines 1-5.
the second mode handoff signal	Symbol #66' in the drawings; paragraph [0037], line 3; paragraph [0037], lines 4-9; paragraph [0045], line 14; paragraph [0049], lines 7-9; paragraph [0050], lines 6-11.
for indicating to a subscriber station	Symbol #42 in the drawings; paragraph [0047], lines 3-5; paragraph [0048], lines 1-7; paragraph [0057], lines 1-5.
operating in the second mode within both of the coverage areas	Intersection of symbols #46 and #50 in the drawings; paragraph [0047], lines 3-5; paragraph [0047], lines 6-7; paragraph [0048], lines 1-7; paragraph [0050], lines 6-11.
to switch from the second mode to the first mode so that the subscriber station operates in the first mode	Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.

Claim 10

CLAIM LANGUAGE	REFERENCE IN APPLICATION AS PUBLISHED
A method for generating a handoff signal at a base station of a type that includes at least one radio-transceiver for receiving and transmitting radio communications with respect to a plurality of subscriber stations, the method comprising:	Symbol #200 in the drawings; paragraph [0044], lines 1-10.
receiving a handoff signal from the at least one radio-transceiver	Symbol #66 in the drawings; paragraph [0035], line 10; paragraph [0035], line 11; paragraph [0035], line 12; paragraph [0035], lines 13-21; paragraph [0039], line 17; paragraph [0045], lines 1-4.
at a first mode	Symbol F2 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9.
respective to a first coverage area;	Symbol #50 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
converting said handoff signal from said first mode to a second mode	Symbol #230 in the drawings; Symbol F2 in the drawings; paragraph [0037], line 1; Paragraph [0037], line 3; paragraph [0040], lines 4-5; paragraph [0043], line 2; paragraph [0045], lines 10-11, paragraph [0049], lines 7-9; paragraph [0058], lines 1-5.
respective to a second coverage area; and,	Symbol #46 in the drawings; paragraph [0032], lines 3-4; paragraph [0035], line 11; paragraph [0039], line 17; paragraph [0049], lines 7-9.

outputting said handoff signal	Symbols #240 and #320 in the drawings; paragraph [0037], lines 4-9; paragraph [0042], line 1; paragraph [0045], lines 15-16; paragraph [0049], lines 1-2.
into said second coverage area,	Symbol #46 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
the second mode handoff signal	Symbol #66' in the drawings; paragraph [0037], line 3; paragraph [0037], lines 4-9; paragraph [0045], line 14; paragraph [0049], lines 7-9; paragraph [0050], lines 6-11.
for indicating to a subscriber station	Symbol #42 in the drawings; paragraph [0047], lines 3-5; paragraph [0048], lines 1-7; paragraph [0057], lines 1-5.
operating in the second mode within both of the coverage areas	Intersection of symbols #46 and #50 in the drawings; paragraph [0047], lines 3-5; paragraph [0047], lines 6-7; paragraph [0048], lines 1-7; paragraph [0050], lines 6-11.
to switch from the second mode to the first mode so that the subscriber station operates in the first mode.	Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.

Claim 17

CLAIM LANGUAGE	REFERENCE IN APPLICATION AS PUBLISHED
A system for performing handoff comprising:	Symbol #30 in the drawings; paragraph [0032], line 1-2.
a first base station	Symbol #38 in the drawings; paragraph [0032], lines 3-4; paragraph [0032], line 7; paragraph [0034], lines 3-4; paragraph [0035], line 2; paragraph [0047], lines 3-5; paragraph [0059], lines 1-9.
operating at a first mode	Symbol F2 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9.
and comprising at least one radio-transceiver for receiving and transmitting radio communications to a plurality of subscriber stations;	Symbol #62 in the drawings; paragraph [0035], lines 8-9; paragraph [0035], line 11; paragraph [0036], lines 1-3.
said at least one radio-transceiver configured to generate a handoff signal at said first mode;	Symbol #66 in the drawings; paragraph [0035], line 10; paragraph [0035], line 11; paragraph [0035], line 12; paragraph [0035], lines 13-21; paragraph [0039], line 17; paragraph [0045], lines 1-4.
a second base station	Symbol #34 in the drawings; paragraph [[0032], line 6.
operating a second mode;	Symbol F1 in the drawings; paragraph [0032], lines 3-4; paragraph [0035], line 11;

	paragraph [0039], line 17; paragraph [0049], lines 7-9.
a handoff device including	Symbol #58 in the drawings.
an input device	input end of Symbol #82 in the drawings; paragraph [0039], line 4.
for receiving said handoff signal from said at least one radio-transceiver at said first mode;	Symbol #66 in the drawings; paragraph [0035], line 10; paragraph [0035], line 11; paragraph [0035], line 12; paragraph [0035], lines 13-21; paragraph [0039], line 17; paragraph [0045], lines 1-4.
an output device for delivering said handoff signal at said second mode	Symbol #90 in the drawings; paragraph [0037], lines 4-9; paragraph [0042], line 1; paragraph [0045], lines 15-16; paragraph [0049], lines 1-2.
in a coverage area respective to said second base station;	Symbol #46 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
a converter coupled to said input device and said output device	Symbols #82 and #86 in the drawings; paragraph [0035], line 12; paragraph [0037], line 1; paragraph [0039], line 1; paragraph [0039], line 4; paragraph [0040], lines 8-10; paragraph [0058], lines 1-5.
for translating the handoff signal from the first mode into the second mode;	Paragraph [0037], line 1; Paragraph [0037], line 3; paragraph [0040], lines 4-5; paragraph [0043], line 2; paragraph [0045], lines 10-11, paragraph [0049], lines 7-9; paragraph [0058], lines 1-5.
the second mode handoff signal	Symbol #66' in the drawings; paragraph [0037], line 3; paragraph [0037], lines 4-9; paragraph [0045], line 14; paragraph [0049], lines 7-9; paragraph [0050], lines 6-11.
for indicating to a subscriber station	Symbol #42 in the drawings; paragraph [0047], lines 3-5; paragraph [0048], lines 1-7; paragraph [0057], lines 1-5.
operating in the second mode within both of the coverage areas	Intersection of symbols #46 and #50 in the drawings; paragraph [0047], lines 3-5; paragraph [0047], lines 6-7; paragraph [0048], lines 1-7; paragraph [0050], lines 6-11.
to switch from the second mode to the first mode.	Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.

Claim 27

CLAIM LANGUAGE	REFERENCE IN APPLICATION AS PUBLISHED
A device for use in a wireless communication system comprising:	Symbol #58 in the drawings.
an input device coupled to a base-station radio-transceiver	input end of Symbol #82 in the drawings; Paragraph [0051], lines 1-2; paragraph

	[0051], lines 9-11.
for receiving a handoff signal from said base-station radio-transceiver	Symbol #66 in the drawings; paragraph [0035], line 10; paragraph [0035], line 11; paragraph [0035], line 12; paragraph [0035], lines 13-21; paragraph [0039], line 17; paragraph [0045], lines 1-4.
at a first mode	Symbol F2 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9.
respective to a first coverage area of the communication system;	Symbol #50 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
an output device for delivering the handoff signal at	Symbol #90 in the drawings; paragraph [0037], lines 4-9; paragraph [0042], line 1; paragraph [0045], lines 15-16; paragraph [0049], lines 1-2.
at least one additional mode	Symbol F1 in the drawings; paragraph [0032], lines 3-4; paragraph [0035], line 11; paragraph [0039], line 17; paragraph [0049], lines 7-9.
respective to at least one additional coverage area;	Symbol #46 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
a converter	Symbols #82 and #86 in the drawings; paragraph [0035], line 12; paragraph [0037], line 1; paragraph [0039], line 1; paragraph [0039], line 4; paragraph [0040], lines 8-10; paragraph [0058], lines 1-5.
for translating the handoff signal from the first mode into the at least one additional mode;	Paragraph [0037], line 1; Paragraph [0037], line 3; paragraph [0040], lines 4-5; paragraph [0043], line 2; paragraph [0045], lines 10-11, paragraph [0049], lines 7-9; paragraph [0058], lines 1-5.
the handoff signal for each of the at least one additional mode indicating	Symbol #66' in the drawings; paragraph [0037], line 3; paragraph [0037], lines 4-9; paragraph [0045], line 14; paragraph [0049], lines 7-9; paragraph [0050], lines 6-11.
to a subscriber station	Symbol #42 in the drawings; paragraph [0047], lines 3-5; paragraph [0048], lines 1-7; paragraph [0057], lines 1-5.
operating at the respective additional mode within the respective coverage area	Intersection of symbols #46 and #50 in the drawings; paragraph [0047], lines 3-5; paragraph [0047], lines 6-7; paragraph [0048], lines 1-7; paragraph [0050], lines 6-11.
to switch from the respective additional mode to the first mode so that the subscriber station operates in the first mode.	Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.

Claim 30

CLAIM LANGUAGE	REFERENCE IN APPLICATION AS PUBLISHED
A base station for use in a wireless communication system comprising:	Symbol #38 in the drawings; paragraph [0032], lines 3-4; paragraph [0032], line 7; paragraph [0034], lines 3-4; paragraph [0035], line 2; paragraph [0047], lines 3-5; paragraph [0059], lines 1-9.
a radio-transceiver for receiving and transmitting radio communications with respect to a plurality of subscriber stations	Symbol #62 in the drawings; paragraph [0035], lines 8-9; paragraph [0035], line 11; paragraph [0036], lines 1-3.
data-processing equipment for carrying at least a portion of said communications over a backhaul; and	Original claim 30
a device for performing handoff comprising	input end of Symbol #82 in the drawings; Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.
an input device for receiving a handoff signal from said radio-transceiver	Symbol #66 in the drawings; paragraph [0035], line 10; paragraph [0035], line 11; paragraph [0035], line 12; paragraph [0035], lines 13-21; paragraph [0039], line 17; paragraph [0045], lines 1-4.
at a first mode	Symbol F2 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9.
respective to a first coverage area of the communication system;	Symbol #50 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
an output device for delivering the handoff signal	Symbol #90 in the drawings; paragraph [0037], lines 4-9; paragraph [0042], line 1; paragraph [0045], lines 15-16; paragraph [0049], lines 1-2.
at a second mode	Symbol F1 in the drawings; paragraph [0032], lines 3-4; paragraph [0035], line 11; paragraph [0039], line 17; paragraph [0049], lines 7-9.
respective to a second coverage area;	Symbol #46 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
a converter coupled to said input device and said output device	Symbols #82 and #86 in the drawings; paragraph [0035], line 12; paragraph [0037], line 1; paragraph [0039], line 1; paragraph [0039], line 4; paragraph [0040], lines 8-10; paragraph [0058], lines 1-5.
for translating the handoff signal from the first mode into the second mode;	Paragraph [0037], line 1; Paragraph [0037], line 3; paragraph [0040], lines 4-5; paragraph [0043], line 2; paragraph [0045], lines 10-11, paragraph [0049], lines 7-9; paragraph [0058], lines 1-5.
the second mode handoff signal	Symbol #66' in the drawings; paragraph [0037], line 3; paragraph [0037], lines 4-9; paragraph [0045], line 14; paragraph [0049], lines 7-9; paragraph [0050], lines 6-11.

for indicating to a subscriber station	Symbol #42 in the drawings; paragraph [0047], lines 3-5; paragraph [0048], lines 1-7; paragraph [0057], lines 1-5.
operating in the second mode within both of the coverage areas	Intersection of symbols #46 and #50 in the drawings; paragraph [0047], lines 3-5; paragraph [0047], lines 6-7; paragraph [0048], lines 1-7; paragraph [0050], lines 6-11.
to switch from the second mode to the first mode so that the subscriber station operates in the first mode.	Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.

Claim34

CLAIM LANGUAGE	REFERENCE IN APPLICATION AS PUBLISHED
A handoff device for use in a wireless CDMA communication system	Symbol #58 in the drawings.
and configured to be coupled to a radio-transceiver	Symbol #62 in the drawings; paragraph [0035], lines 8-9; paragraph [0035], line 11; paragraph [0036], lines 1-3.
of a base station,	Symbol #38 in the drawings; paragraph [0032], lines 3-4; paragraph [0032], line 7; paragraph [0034], lines 3-4; paragraph [0035], line 2; paragraph [0047], lines 3-5; paragraph [0059], lines 1-9.
the handoff device comprising an input device	input end of Symbol #82 in the drawings; Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.
for receiving a CDMA re-direction signal from the radio-transceiver	Symbol #66 in the drawings; paragraph [0035], line 10; paragraph [0035], line 11; paragraph [0035], line 12; paragraph [0035], lines 13-21; paragraph [0039], line 17; paragraph [0045], lines 1-4.
at a first frequency	Symbol F2 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9.
respective to a first coverage area of said communication system;	Symbol #50 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
a first converter connected to said input device for converting said CDMA re-direction signal from said first frequency to an intermediate frequency;	Symbol #82 in the drawings; paragraph [0039], lines 4-13.
a second converter connected to said first converter for converting said CDMA re-direction signal from said intermediate frequency to a second frequency;	Symbol #86 in the drawings; paragraph [0035], line 12; paragraph [0037], line 1; paragraph [0039], line 1; paragraph [0040], lines 8-10; paragraph [p0058], lines 1-5.
an output device connected to said second converter for delivering said CDMA re-	Symbol #90 in the drawings; paragraph [0037], lines 4-9; paragraph [0042], line 1;

direction signal	paragraph [0045], lines 15-16; paragraph [0049], lines 1-2.
at said second frequency	Symbol F1 in the drawings; paragraph [0032], lines 3-4; paragraph [0035], line 11; paragraph [0039], line 17; paragraph [0049], lines 7-9.
within a second coverage area;	Symbol #46 in the drawings; paragraph [0032], lines 3-4; paragraph [0049], lines 7-9; paragraph [0055], lines 1-11.
said CDMA re-directional signal for indicating	Symbol #66' in the drawings; paragraph [0037], line 3; paragraph [0037], lines 4-9; paragraph [0045], line 14; paragraph [0049], lines 7-9; paragraph [0050], lines 6-11.
to a subscriber station	Symbol #42 in the drawings; paragraph [0047], lines 3-5; paragraph [0048], lines 1-7; paragraph [0057], lines 1-5.
operating in said second frequency and within both of said coverage areas	Intersection of symbols #46 and #50 in the drawings; paragraph [0047], lines 3-5; paragraph [0047], lines 6-7; paragraph [0048], lines 1-7; paragraph [0050], lines 6-11.
to switch from said second frequency to said first frequency.	Paragraph [0051], lines 1-2; paragraph [0051], lines 9-11.

VI. 37 CFR §41.37 (c)(1)(vi) - Grounds of Rejection to be Reviewed on Appeal

(a) Whether claims 1-2, 4-8, 10-11, 13-18, 20-23, 27, 34-37, 39 and 40 are unpatentable under 35 U.S.C. §102(b) over U.S. Patent No. 6,430,200 (Han).

(b) Whether claims 3, 12, 19 and 38 are unpatentable under 35 U.S.C. §103(a) over Han in view of U.S. Patent No. 6,771,964 (Einola).

(c) Whether claims 9 and 24 are unpatentable under 35 U.S.C. §103(a) over Han in view of U.S. Patent Application Publication No. 2004/0224711 (Panchal).

(d) Whether claims 30-32 are unpatentable under 35 U.S.C. §103(a) over Han in view of U.S. Patent No. 6,353,742 (Bach).

VII. 37 CFR §41.37 (c)(1)(vii) - Arguments

(a) REJECTION OF CLAIMS 1-2, 4-8, 10-11, 13-18, 20-23, 27, 34-37, 39 AND 40 UNDER 35 U.S.C. §102(B) OVER U.S. PATENT NO. 6,430,200 (HAN).

1. Synopsis of Han

Han discloses an "apparatus and method for generating a pilot signal for hard hand-off" (see Abstract). In particular, Han provides a "pilot signal generator of a base station for generating an identifying pilot signal corresponding to a target base station to perform inter-frequency hard hand-off" (see Abstract).

In describing the principle of hard handoff, Han states (see col. 1, lines 47-65, in the section entitled "BACKGROUND"):

> "A hard hand-off is generally performed as follows. The source base station continuously measures the signal strength of a mobile station within its cell region to determine if the signal strength drops below a predetermined threshold value. When the received signal strength falls below the threshold, the source base station determines that the mobile station is located at the boundary of its cell region, and then signals a base station controller (BSC). The BSC then decides which base station (i.e. target base station) receives a relatively strong signal from the mobile station.
>
> When it is determined that a particular target base station (e.g., a neighboring base station) receives a strong signal, the BSC transmits a hand-off request message to the target base station, as well as a command to the mobile station to communicate with the target base station (neighboring base station). The mobile station then performs a hand-off and, accordingly, communication between the mobile station and the target base station is established."

Han then indicates that a pilot signal can be used for hard hand-off (see col. 2, lines 15-21, still in the section entitled "BACKGROUND"):

> "A conventional method for performing a hard hand-off using a pilot signal ... uses a pilot beacon for generating an identifying pilot signal corresponding to a target base station."

The foregoing serves as the backdrop for Han's invention, which is directed at an improved way of generating the aforementioned pilot signal for hard hand-off. More

specifically, one may start by first appreciating the conventional approach as explained by Han (see col. 2, lines 32-46, still in the section entitled "BACKGROUND", and referring to Fig. 1):

> "The digital MODEMs 200 and 210, transceiver 300 and 310, and power amplifiers 400 and 410 are utilized for communication, whereas a pilot signal generator (which generates an identifying pilot signal corresponding to a target base station) includes the digital MODEM 220 for generating a pilot signal, the transceiver 320 and the power amplifier 420. As a mobile station moves to a target base station, the mobile station simultaneously receives a weak pilot signal from the source base station and a relatively strong pilot signal from the target base station. Accordingly, the mobile station will request a hand-off and the digital MODEM 220 of the pilot signal generator will only transmit the overhead channel such as, for example, a pilot, synchronization, and paging."

According to Han, the above conventional approach has "disadvantages associated with the conventional pilot signal generator" (col. 3, lines 5-6), such as size, cost, limited portability and tendency to cause imbalance in coverage areas of multiple frequencies. Thus, Han provides an improved "APPARATUS AND METHOD FOR GENERATING A PILOT SIGNAL IN ORDER TO PERFORM A HARD HAND-OFF" (see Title). In particular, Han states (at col. 5, lines 3-13, in the section entitled "DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS", and referring to Fig. 2):

> "The base station includes a first digital MODEM 200 and an IF amplifier / divider 100. The first digital MODEM 200 produces an intermediate frequency which results in frequency #1. The IF amplifier / divider 100 divides a signal from the digital MODEM 200 into a service RF path unit 500 ... and an RF path unit 530" (col. 4, lines 53-60). The MODEM 200 "produces a signal that results in a frequency #1 for actual communication. However, ... the IF amplifier / divider 100 coupled to the digital MODEM 200 (Fig. 2) transmits a first portion of the divided IF signal through the service RF path unit 500 for generating a frequency #1 (which is utilized for actual communication), and a second portion of the divided IF signal through the RF path unit 530 for producing frequency #3 (which is utilized for generating a pilot signal)."

Han's teachings can therefore be summarized as the combination of the IF amplifier / divider 100 ("*for dividing an intermediate frequency (IF) signal received from a digital MODEM into a first signal and a second signal*"—see claim 1) together with

the service RF path unit 500 ("*for up-converting said first signal ... into a first radio frequency (RF) signal ... for actual communications*"—also see claim 1) and the RF path unit 530 ("*for up-converting said second signal ... into a second RF signal ... being an identifying pilot signal corresponding to said target base station for performing said hard hand-off*"—again see claim 1). Later portions of Han disclose various detailed implementations of the IF amplifier / divider 100, but these are not believed to be relevant for the purposes of the present discussion.

2. Discussion of Claim 1

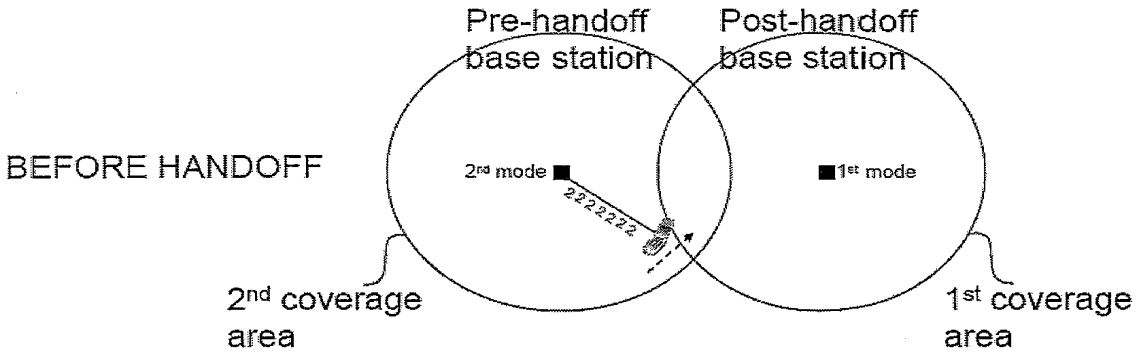
Claim 1 is reproduced below for ease of reference:

> 1. A device for integration into a base station of a type that includes at least one radio-transceiver for receiving and transmitting radio communications to a plurality of subscriber stations; the device comprising:
>
> an input device operable to be coupled to the at least one radio-transceiver for receiving a handoff signal from the at least one radio-transceiver at a first mode respective to a first coverage area of the communication system;
>
> an output device for delivering the handoff signal at a second mode respective to a second coverage area;
>
> a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode.

One particular feature of claim 1 is the "converter" which translates the "handoff signal" from the "first mode" to the "second mode". It is worth exploring this feature in some detail. Specifically, consider a "pre-handoff" base station that is configured to communicate with subscriber stations in the second (2^{nd}) mode, and a "post-handoff" base station that is configured to communicate with subscriber stations in the first (1^{st}) mode.

Consider now a particular subscriber station that is being serviced by the pre-handoff base station (i.e., operating in the 2^{nd} mode) and which is about to enter an area that

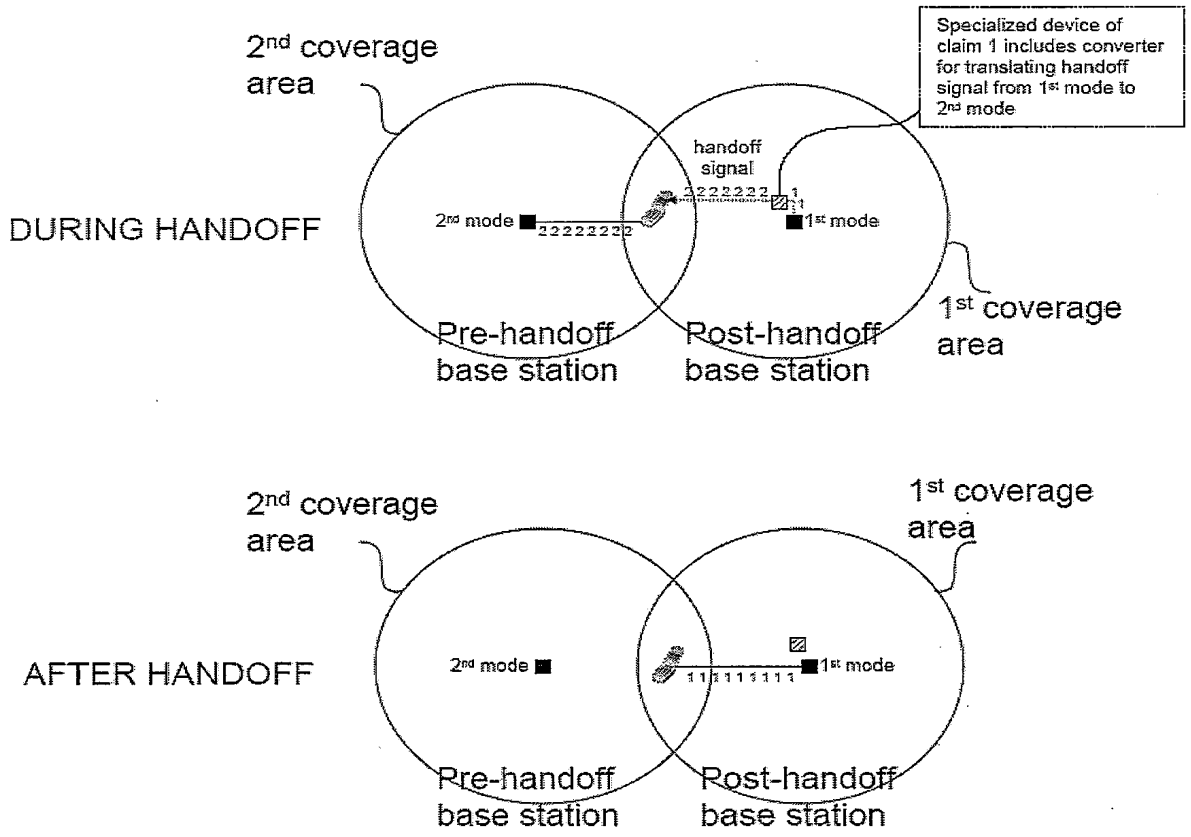
intersects the coverage areas serviced by the pre-handoff base station and the post-handoff base station. The situation is illustrated as follows, where the dashed arrow illustrates the direction of movement of the particular subscriber station and the series of numbers ([2 2 2 2 etc.] or [1 1 1 1 etc.], as the case may be) conceptually indicates the mode in which communication is being carried out:



As the particular subscriber station enters the intersection of the two coverage areas, handoff can then occur. In particular, a radio transceiver in the post-handoff base station (which, it is recalled, operates in the 1st mode) generates a handoff signal. A potential problem arises, however, because the handoff signal will be generated in the 1st mode, whereas the particular subscriber station is actually communicating with the pre-handoff base station in the 2nd mode. Thus, without any further intervention, the handoff signal would not be properly received by the particular subscriber station. To solve this potential problem, a device integrated into the post-handoff base station translates the handoff signal from the 1st mode to the 2nd mode so that it will be properly received by the particular subscriber station.

Specifically, there is a need for a specialized device (i.e., the device claimed in claim 1) at the post-handoff base station that receives the handoff signal in the 1st mode (i.e., the native mode of the post-handoff base station) and incorporates "a converter [...] for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to [the particular] subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the [particular] subscriber station operates in the

first mode." The situation is illustrated as follows (see also Fig. 7 and Applicants' published application at paragraph [0049], lines 6-9, with F2 corresponding to the 1st mode and F1 corresponding to the 2nd mode.) :



It can be observed that the handoff signal, which was received by the specialized device in the 1st mode, but is then translated into the 2nd mode by the converter, manages to "infiltrate" the subscriber station which, conveniently, had up until then been communicating with the pre-handoff base station in the 2nd mode. The handoff signal then provokes a change in the operating mode of the particular subscriber station (causing it to switch to the 1st mode) and the subscriber station then continues communicating with the post-handoff base station in the 1st mode.

Thus, the "AFTER HANDOFF" situation is the same compared to the conventional approach, whereby the particular subscriber station ends up communicating with the post-handoff base station in the 1st mode. However, the "DURING HANDOFF"

situation is dramatically different. Specifically, the translation provided by the presently claimed converter and device allows the handoff signal from the post-handoff base station, which normally operates in the 1st mode, to nevertheless be sent to the particular subscriber station in the 2nd mode. In this way, handoff can be more robust, which can lead to advantageous performance, such as fewer dropped calls.

3. Comparison of Claim 1 to Han

Applicants respectfully submit that the claimed invention is well beyond the teachings or suggestions of Han.

To begin with, Han does not discuss the mode in which a mobile station operates when handoff is occurring. Therefore, it is inconceivable that Han would execute the type of handoff that is contemplated by the claimed invention, whereby the handoff signal (i) is translated from a first mode into a second mode and furthermore (ii) indicates to a subscriber station operating in the second mode to switch from the second mode to the first mode (from which the handoff signal was initially translated). Stated differently, the claimed invention utilizes knowledge of the mode in which the subscriber station is currently operating in order to (i) receive a handoff signal originally generated in a target mode; (ii) convert it into that current mode; and then (iii) deliver it to the subscriber station in the current mode to tell it to switch into the target mode in which the handoff signal was originally generated.

In contrast, Han merely uses the IF amplifier / divider 100 to generate a signal at a frequency #3 from a signal at a frequency #1. Han does not take into consideration the mode that a target mobile station is operating in when handoff is desired. Such knowledge is simply not of any relevance in Han and does not influence operation of the IF amplifier / divider 100; rather, the frequency at which the pilot signal is generated will always remain frequency #3, regardless of the mode in which the mobile station happens to be operating when handoff is desired.

Moreover, there is no indication that transmitting the pilot signal at frequency #3 serves to instruct the mobile station to "switch" to frequency #1. In particular, Han does not contemplate the possibility that the mobile station would "switch from" frequency #3 "to" frequency #1. This can be explained by noting that frequency #3 carries only a pilot signal (i.e., is not used for "actual communications") and is expected to be received by the mobile station regardless of the frequency used for "actual communications".

In fact, it should be pointed out that Han does not actually provide any details about a "handoff signal" in the first place. Recalling that the pilot signal transmitted at frequency #3 is "an identifying pilot signal corresponding to a target base station" (see Abstract), it should be apparent that the strength of the pilot signals transmitted by different base stations, as detected by the mobile station, are used as a basis on which to choose a target base station with which the mobile station is to effect a hard handoff. As stated earlier in this subsection, "[a]s a mobile station moves to a target base station, the mobile station simultaneously receives a weak pilot signal from the source base station and a relatively strong pilot signal from the target base station. Accordingly, the mobile station will request a hand-off and the digital MODEM 220 of the pilot signal generator will only transmit the overhead channel such as, for example, a pilot, synchronization, and paging" (see col. 2, lines 39-46). The foregoing passage mentions a request by the mobile station, but does not describe a handoff signal. Moreover, the foregoing passage teaches that the pilot signal generator transmits "pilot, synchronization, and paging" overhead channels but makes no mention of a "handoff signal", let alone a handoff signal having the claimed characteristics.

Thus, it should be abundantly clear that Han fails to teach or suggest the claimed feature of "*a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode;* ***the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode***" (emphasis added).

In view of the above, it is respectfully submitted that Han does not anticipate claim 1, and withdrawal of the rejection of claim 1 is respectfully requested.

Since claims 10, 17, 27 and 34 include language similar to that of claim 1, it is therefore respectfully submitted that claims 10, 17, 27 and 34 are not anticipated by Han for at least the same reasons as those set forth above in respect of claim 1. Applicants therefore respectfully request withdrawal of the rejection of claims 10, 17, 27 and 34.

Also, each of claims 2, 4-8, 11, 13-16, 18, 20-23, 35-37, 39 and 40 depends from one of claims 1, 10 and 17 and, as such, incorporates by reference all the features contained therein, including at least one feature shown above as not having been taught by Han, as well as additional features that further distinguish the claimed invention over Han. It is therefore respectfully submitted that claims 2, 4-8, 11, 13-16, 18, 20-23, 35-37, 39 and 40 are not anticipated by Han. Applicants therefore respectfully request withdrawal of the rejection of claims 2, 4-8, 11, 13-16, 18, 20-23, 35-37, 39 and 40.

4. Response to Examiner's Arguments

While the above arguments are believed to be sufficient to demonstrate that the claimed invention is not anticipated by Han, Applicants nevertheless address the Examiner's arguments made in the Office Action mailed May 21, 2010 in the hope of demonstrating the extent to which Han is insignificant as a prior art reference.

In particular, reference is made to the Examiner's argument on pages 2-4 of the Office Action, which appears on the next page and has been annotated for ease of reference:

For **claims 1, 10, 17, 27, and 35**, Han et al. teach a device, a method, and system for integration into a base station (see apparatus in Fig. 2. Fig. 2 is a base station, see col. 4, lines 15-17 for description of Fig. 2), a method (see Title), a system and a base station (see Fig. 2) of a type that includes at least one radio-transceiver (see 300, 310, and 330 in Fig. 2) for receiving and transmitting radio communications to a plurality of subscriber stations (The 300, 310, and 330 are for receiving and transmitting radio communications to a plurality of subscriber stations, see col. 2, lines 39-42 for description of receiving and transmitting radio communications regarding source BS and target BS when the mobile station –subscriber- is moving. Note that although the Fig. 2 only shows arrows for processing with one direction, it is known in the art that the transceiver works at both directions for receiving and transmitting. And it is known in the art that each BS communicates with a plurality of subscriber stations, see cited Jonsson reference, Abstract, for evidence), the device comprising:

an input device (see Modem 200 in Fig. 2) configured to be coupled to the at least one radio-transceiver (see 200 – 100 – 500 in Fig. 2) for receiving a handoff signal (the digital hardware MODEM is used for a hand-off, see col. 2, lines 66-67. It implies receiving a handoff signal, And, as described above, the transceiver is also for receiving the request from the mobile station, then send to the Modem) from the at least one radio-transceiver (the mobile station will request a hand-off, see col. 2, line 43) at a first mode respective to a first coverage area of the communication system (see FA #1 in Fig. 2);

(i)

an output device (see 530 in Fig. 2) for delivering the handoff signal (the IF amplifier/divider 100 transmits ... a second portion of the divided IF signal through the RF path unit 530 for producing frequency #3 (which is utilized for generating a pilot signal), see col. 5, lines 11-13) at a second mode (frequency #2, see Fig. 2) respective to a second coverage area (coverage areas of multiple frequencies, refer to col. 5, lines 9-17, and frequency #2, see col. 4, line 64 & lines 61-64, and Fig. 2. It implies that the frequency #2 covers second area);

(ii)

(iii)

a converter (see 210 in Fig. 2) coupled to said input device and said output device (see Fig. 2. The 210 is coupled to 200 and 510) for translating the handoff signal from the first mode into the second mode (MODEM 210, which is coupled to a service RF path unit 510, produces an intermediate frequency which results in a frequency #2, see col. 4, lines 61-64. Note that the Examiner interprets "produces" as (1) uses the IF - FA #3, the pilot signal generated from unit 100 in Fig. 2 to switch from FA 1 to FA 2; or (2) in the case of mobile station moving from area #2 to area #1, the functions of Modem 1 and 2 will be swapped, so the Modem 210 can play the function of Modem 200 to produce the handoff signal); the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode (coverage areas of multiple frequencies, refer to col. 5, lines 9-17. It implies that the frequency #1 covers first area and the frequency #2 covers second area).

(iv)

(v)

(vi)

(vii)

With reference to the above excerpts annotated (i) to (vii), Applicants provide the following remarks:

(i) The Examiner seems to contend that in Han, the transceiver in the RF service path unit 500 receives a "request from the mobile station" and then sends a signal to the modem 200. This signal is equated by the Examiner to the claimed handoff signal. However, it will be noted that the claimed handoff signal is "for indicating to a subscriber station ... to switch [modes]". Thus, the direction of travel of the claimed handoff signal is totally opposite to the direction of travel of Han's "request from the mobile station" travels. ***It is respectfully submitted that the interpretation of Han adopted by the Examiner is inconsistent with the claim language.***

(ii) The Examiner takes the position that "the handoff signal" is transmitted from the amplifier/divider 100 through the RF path unit 530. Notwithstanding Applicants' observation that Han does not explicitly discuss a handoff signal to begin with (see subsection **VII (a) 3**, *supra*), the position taken by the Examiner is totally contradictory to the view taken in paragraph (i). In other words, if "the handoff signal" in Han is a signal traveling from the mobile station to the modem 200 via the RF service path unit 500 and the IF amplifier/divider 100 (according to the view expressed in paragraph (i)), it is illogical to suggest that "the handoff signal" is now the signal travelling from the IF amplifier/divider 100 to the RF path unit 530. ***It is respectfully submitted that the Examiner has adopted a self-contradictory interpretation of the expression "the handoff signal".***

(iii) The Examiner considers Han's IF amplifier/divider as part of the claimed "output device" and moreover considers "frequency #2" as corresponding to the claimed "second mode". However, it will be clear from Han that the signal at the output of the IF amplifier/divider 100 includes a first portion at frequency #1 and a second portion at frequency #3, but does not include any signal at frequency #2 ("frequency #2"). ***It is respectfully submitted that the interpretation of Han adopted by the Examiner is incorrect.***

(iv) The Examiner takes the view that Han's modem 210 produces an intermediate frequency which results in a frequency #2, and that by "produces", the Examiner

means that frequency #3 is used to switch from frequency #1 to frequency #2. However, the Examiner's interpretation is incomprehensible in view of Han. In particular, Han does not explicitly discuss a handoff signal, much less any converter for translating this handoff signal from a first mode into a second mode. Even if a mobile station in Han were to go from exchanging traffic at frequency #1 to frequency #2, this would be achieved without a converter of the type that is being claimed. ***It is respectfully submitted that the Examiner has not made a tenable argument to suggest that this feature of the claim is taught by Han.***

(v) The Examiner seems to take the position that the functions of Han's "modem 1" and "modem 2" can be swapped, so the modem 210 can play the function of modem 200" However, the pilot signal is only ever generated in Han by the IF amplifier/divider 100, which is connected to modem 200 but not to modem 210. It is therefore illogical to suggest that the hardware configuration of Han should change (i.e., to connect the IF amplifier/divider 100 to modem 210 instead of to modem 200) as a function of whether mobile station moves from area X to area Y or vice versa. ***It is respectfully submitted that the Examiner's suggested modified configuration is not taught by Han and, moreover, is inconsistent with the teachings of Han.***

(vi) The Examiner takes the position that "Modem 210 can play the function of Modem 200 to produce the handoff signal". Notwithstanding Applicants' observation that Han does not explicitly discuss a handoff signal to begin with (see subsection **VII (a) 3**, *supra*), the position taken by the Examiner is totally contradictory to the view taken in paragraph (i). In other words, if "the handoff signal" in Han is a signal traveling from the mobile station to the modem 200 via the RF service path unit 500 and the IF amplifier/divider 100 (according to the view expressed in paragraph (i)), it is illogical to suggest that "the handoff signal" is now produced by modem 210 (or even modem 200). ***It is respectfully submitted that the Examiner has adopted a self-contradictory interpretation of the expression "the handoff signal.***

(vii) The Examiner has left the latter part of the claim "*the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so*

that the subscriber station operates in the first mode" effectively unexamined. If Han were truly relevant to the claimed invention, the Examiner should be able to map the teachings of Han to this last claimed element, which deals with the "infiltration" aspect discussed at length earlier in this Appeal Brief (see subsection **VII (a) 2**, *supra*). Yet the Examiner merely points to a passage of Han that discloses little more than an IF signal divided into a first signal at a frequency #1 and a second signal at a frequency #3, without any indication as to how this teaches or suggests the claimed feature. ***It is respectfully submitted that the Examiner has not made a tenable argument to suggest that this feature of the claim is taught by Han.***

For all of the above reasons, Applicants therefore respectfully request favourable reconsideration and allowance of claims 1-2, 4-8, 10-11, 13-18, 20-23, 27, 34-37, 39 and 40.

VII. 37 CFR §41.37 (c)(1)(vii) - Arguments [*continued*]

(b) REJECTION OF CLAIMS 3, 12, 19 AND 38 UNDER 35 U.S.C. §103(A) AS BEING UNPATENTABLE OVER HAN IN VIEW OF U.S. PATENT NO. 6,771,964 (EINOLA).

It is noted that each of claims 3, 12, 19 and 38 is dependent on claim 1 or 17 and therefore includes all the features of the respective base claim including those that were already shown to be absent from Han (see subsection **VII (a) 3**, *supra*). From this it should be clear that there are significant differences between the claimed invention and Han, which are beyond the level of ordinary skill in the art.

Turning now to Einola, the Examiner alleges that this reference teaches: "GSM, TDMA, CDMA, etc., see col. 1, lines 15-20, and col. 2, line 18".

However, even if the Examiner's allegation were true and Einola did teach the above feature, Einola would still fail to overcome the deficiencies of Han that were discussed earlier (see subsection **VII (a) 3**, *supra*) as they apply to claims 1 and 17, on which claims 3, 12, 19 and 38 depend.

More specifically, Einola is concerned with "[a] method and a wireless telecommunication system of performing network-assisted handover of calls between a serving network and another wireless network that employs communication protocols different from those of the serving network ... The serving wireless network sends a message to the neighboring wireless network to request a handover of the communication transaction when the quality of the radio signals between the neighboring wireless network and the mobile station meets a predetermined minimum threshold. Then a handover of the communication transaction from the serving wireless network to the neighboring wireless network is executed after the neighboring wireless network has established a communication channel for the mobile station pursuant to the handover request" (see Abstract).

Although Einola discloses a handover request (in particular, "HO Request", see Figs. 2 and 3 and accompanying description), such handover requests are not delivered (at a

second mode), do not indicate to the mobile station to switch from the second mode to a first mode, and are not the outcome of a translation from the first mode into the second mode. Moreover, Einola's treatment of the aforementioned handover requests precedes the actual handover, as can be seen from col. 7, lines 26-30 of Einola, which state that "[a]fter the UMTS network 28 has established a communication channel for the MS 16 using, for example, the information contained in UMTS AN CM, a handover procedure is executed." However, further details regarding such "handover procedure" are not provided, and certainly there is no teaching or suggestion of a handoff signal having the claimed features.

Thus, it should be clear that Einola fails to teach or suggest the claimed feature of "*a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode*".

As such, it is respectfully submitted that even with the teachings of Einola added to those of Han, the differences between the claimed invention and the cited art would still be beyond the level of ordinary skill in the art. Withdrawal of the rejection of claims 3, 12, 19 and 38 is therefore respectfully requested.

VII. 37 CFR §41.37 (c)(1)(vii) - Arguments [*c o n t i n u e d*]

(c) REJECTION OF CLAIMS 9 AND 24 UNDER 35 U.S.C. §103(A) AS BEING UNPATENTABLE OVER HAN IN VIEW OF U.S. PATENT APPLICATION PUBLICATION NO. 2004/0224711 (PANCHAL).

It is noted that each of claims 9 and 24 is dependent on claim 1 or 17 and therefore includes all the features of the respective base claim including those that were already shown to be absent from Han (see subsection **VII (a) 3** *supra*). From this it should be clear that there are significant differences between the claimed invention and Han, which are beyond the level of ordinary skill in the art.

Turning now to Panchal, the Examiner alleges that this reference teaches: "processor ... receives the information ... and stores the identity of the BS 106 traffic channel, TCH 111, and/or other soft handoff information, see [0033]".

However, even if the Examiner's allegation were true and Panchal did teach the above feature, Panchal would still fail to overcome the deficiencies of Han that were discussed earlier (see subsection **VII (a) 3**, *supra*) as they apply to claims 1 and 17, on which claims 9 and 24 depend.

More specifically, Panchal is concerned with a "[m]ethod and apparatus for CDMA soft handoff for dispatch group members" (see Title), which "address[es] the need to provide listening participants of CDMA dispatch services soft handoff signaling capability" (see Abstract) by providing "the concept of "shared channel signaling windows" for shared traffic channels" (Abstract). According to Panchal, "[i]n one embodiment, the base site (105) announces the beginning of a signaling window for the traffic channel, allowing remote units (e.g., MS 120) that need to send handoff signaling an opportunity. In response to such signaling, the base site directs soft handoff information to the signaling remote units via the traffic channel. However, all the remote units that share the traffic channel can store this soft handoff information and later use the information to initiate soft handoffs without needing to exchange handoff messaging with the base site" (see Abstract).

In contrast to Han, Panchal provides some detail as to the manner in which handoff is carried out. In particular, Panchal states that (see paragraph [0032]):

> "In response to receiving soft handoff signaling from MS 120, processor 203, via transmitter 201 and TCH 110, sends soft handoff information that is directed to MS 120. Since this soft handoff information is sent in response to the PSMM, it may take the form of a Handoff Directed Message, which identifies a traffic channel at BS 106 that can be used for soft handoff (i.e., TCH 111). However, soft handoff information could alternatively take the form of a Neighbor List Update Message, for example."

As can be seen from the foregoing, Panchal sends soft handoff information directed to MS 120 over traffic channel TCH 110. While the soft handoff information may identify a traffic channel that can be used for soft handoff (e.g., TCH 111), Panchal is devoid of any discussion of a converter having the claimed properties. Such a converter, if it existed in Panchal, would be used fpr converting the soft handoff information from TCH 111 into TCH 110 so that it can be received by MS 120 on TCH 110 (thereafter causing MS 120 to switch to TCH 111). The fact that such a converter is absent from Panchal shows that Panchal does not remedy the aforementioned defects of Han.

Applicants would like to remark that Panchal's lack of a converter is in fact not surprising, because Panchal is concerned with sending soft handoff information from a pre-handoff base station to MS 120 in order to cause it to communicate with a post-handoff base station, whereas it will be noted that in the context of the present invention (see figures in subsection **VII (a) 2**, *supra*), the handoff signal is being sent from the post-handoff base station, but in a mode that is being used by the pre-handoff base station.

Thus, it should be clear that Panchal fails to teach or suggest the claimed feature of "*a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode*".

As such, it is respectfully submitted that even with the teachings of Panchal added to those of Han, the differences between the claimed invention and the cited art would still be beyond the level of ordinary skill in the art. Withdrawal of the rejection of claims 9 and 24 is therefore respectfully requested.

VII. 37 CFR §41.37 (c)(1)(vii) - Arguments [*continued*]

(d) REJECTION OF CLAIMS 30-32 UNDER 35 U.S.C. §103(A) AS BEING UNPATENTABLE OVER HAN IN VIEW OF U.S. PATENT NO. 6,353,742 (BACH).

Claim 30 is reproduced below for ease of reference:

> 30. A base station for use in a wireless communication system comprising::
>
> a radio-transceiver for receiving and transmitting radio communications with respect to a plurality of subscriber stations;
>
> data-processing equipment for carrying at least a portion of said communications over a backhaul; and
>
> a device for performing handoff comprising an input device for receiving a handoff signal from said radio-transceiver at a first mode respective to a first coverage area of the communication system; an output device for delivering the handoff signal at a second mode respective to a second coverage area; a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode.

It should be appreciated that claim 30 includes as one of its components a device having the features claimed in claim 1. Therefore, the arguments set forth above in defense of claim 1 vis-à-vis Han also apply to claim 30.

In particular, it was made abundantly clear that Han fails to teach or suggest the claimed feature of "*a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode*". From this it should be clear that there are significant differences between the claimed invention and Han, which are beyond the level of ordinary skill in the art.

Turning now to Bach, the Examiner alleges that this reference teaches: "different delays can be caused by differential delays in each base station's backhaul, by BTS

processing delays, by the propagation delays of uplink communication signals, see col. 5, lines 45-47".

However, even if the Examiner's allegation were true and Bach did teach the above feature, Bach would still fail to overcome the deficiencies of Han that were discussed earlier (see subsection **VII (a) 3**, *supra*).

More specifically, Bach is concerned with "a method and apparatus for backhauling data in a communication system (100). A plurality of quality metrics are received at a centralized controller (105) from a plurality of base stations (101-104). The quality metrics are related to a data frame transmitted to the base stations (101-104) from a remote unit (113). A preferred data frame is determined from among the data frames. The centralized controller (105) then signals the base station associated with the preferred data frame to send the preferred data frame to the centralized controller." (see Abstract).

Bach indicates that "[b]y sending quality metrics from base stations 101-103 to selector distribution unit 115 and allowing selector distribution unit 115 to choose the best quality frame, the amount of data backhauled in the communication system is reduced. This is particularly true during periods when a remote unit is transmitting frames to multiple base stations, such as during soft handoff" (see col. 4, lines 29-35) As will be observed, Bach's treatment of handoff is extremely limited, and in particular, there is no mention of a "handoff signal", nor of such signal being delivered (at a second mode), or indicating to the mobile station to switch from the second mode to a first mode, or being the result of a translation from the first mode into the second mode.

Thus, it should be clear that Bach fails to teach or suggest the claimed feature of "*a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode*".

As such, it is respectfully submitted that significant differences exist between the subject matter of claim 30 and the combination of Han and Bach. It is submitted that these differences are beyond the level of ordinary skill in the art. Withdrawal of the rejection of claim 30 is therefore respectfully requested.

Claims 31 and 32 are dependent on claim 30 and therefore withdrawal of the rejection of these claims on the same grounds as those set forth above in support of claim 30 is respectfully requested.

VIII. 37 CFR §41.37 (c)(1)(viii) - Claim Appendix

The following is a listing of the claims involved in the present appeal.

1. A device for integration into a base station of a type that includes at least one radio-transceiver for receiving and transmitting radio communications to a plurality of subscriber stations; the device comprising:

an input device configured to be coupled to the at least one radio-transceiver for receiving a handoff signal from the at least one radio-transceiver at a first mode respective to a first coverage area of the communication system;

an output device for delivering the handoff signal at a second mode respective to a second coverage area;

a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode.

2. The device according to claim 1 wherein said first coverage area and said second coverage area of said system are each based on a respective protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

3. The device according to claim 2 wherein said protocols respective to said coverage areas are different.

4. The device according to claim 1 wherein said handoff signal is a conventional CDMA re-direction signal, and wherein said first mode is a first frequency and said second mode is a second frequency different from said first frequency.

5. The device according to claim 4 wherein said first coverage area and said second coverage area are served by respective CDMA base stations.

6. The device according to claim 1 wherein said output device is configured to transmit said handoff signal to a base station power combiner for delivering said converted handoff signal to a base station antenna for outputting said handoff signal.

7. The device according to claim 4 wherein said converter comprises a down-converter configured to receive said handoff signal from said input device and for converting said handoff signal from said first frequency to an intermediate frequency and an up-converter for converting said intermediate frequency to said second frequency.

8. The device according to claim 7 further comprising a microcontroller operably connected to said down-converter and said up-converter such that said first frequency and said second frequency is user-selectable.

9. The device according to claim 8 wherein said microcontroller is further configured to perform at least one of logging various conversions performed by said converter, and generating alarms upon occurrence of a pre-determined event.

10. A method for generating a handoff signal at a base station of a type that includes at least one radio-transceiver for receiving and transmitting radio communications with respect to a plurality of subscriber stations, the method comprising:

receiving a handoff signal from the at least one radio-transceiver at a first mode respective to a first coverage area;

converting said handoff signal from said first mode to a second mode respective to a second coverage area; and,

outputting said handoff signal into said second coverage area, the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode.

11. The method according to claim 10 wherein said first coverage area and said second coverage area are each based on a respective protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

12. The method according to claim 11 wherein said protocols respective to said coverage areas are different.

13. The method according to claim 10 wherein said handoff signal is a conventional CDMA re-direction signal, and wherein said first mode is a first frequency and said second mode is a second frequency different from said first frequency.

14. The method according to claim 13 wherein said first coverage area and said second coverage area are served by respective CDMA base stations.

15. The method according to claim 10 wherein outputting of said handoff signal comprises transmitting said handoff signal to a base station power combiner for delivering said converted handoff signal to a base station antenna for outputting said handoff signal into said second coverage area.

16. The method according to claim 13 further comprising receiving an input signal identifying at least one said frequencies for use in performing a remainder of the steps.

17. A system for performing handoff comprising:

a first base station operating at a first mode and comprising at least one radio-transceiver for receiving and transmitting radio communications to a plurality of subscriber stations; said at least one radio-transceiver configured to generate a handoff signal at said first mode;

a second base station operating a second mode;

a handoff device including an input device for receiving said handoff signal from said at least one radio-transceiver at said first mode; an output device for delivering said handoff signal at said second mode in a coverage area respective to said second base station; a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode.

18. The system according to claim 17 wherein said first base station and said second base station of said system are based on a protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

19. The system according to claim 18 wherein said protocols respective to said coverage areas are different.

20. The system according to claim 17 wherein said handoff signal is a conventional CDMA re-direction signal, and wherein said first mode is a first frequency and said second mode is a second frequency different from said first frequency.

21. The system according to claim 17 wherein said first base station further comprises a base station power combiner and a base station antenna coupled to said base station power combiner for transmitting radio communications to a plurality of subscriber

stations; said output device further configured to transmit said handoff signal to said base station power combiner.

22. The system according to claim 20 wherein said converter comprises a down-converter configured to receive said handoff signal from said input device and for converting said handoff signal from said first frequency to an intermediate frequency and an up-converter for converting said intermediate frequency to said second frequency.

23. The system according to claim 22 further comprising a microcontroller operably connected to said down-converter and said up-converter such that said first frequency and said second frequency is user-selectable.

24. The system according to claim 23 wherein said microcontroller is further configured to perform at least one of logging various conversions performed by said converter, and generating alarms if said converter operates outside of desired specifications.

25. (*cancelled*)

26. (*cancelled*)

27. A device for use in a wireless communication system comprising:

an input device coupled to a base-station radio-transceiver for receiving a handoff signal from said base-station radio-transceiver at a first mode respective to a first coverage area of the communication system;

an output device for delivering the handoff signal at at least one additional mode respective to at least one additional coverage area;

a converter for translating the handoff signal from the first mode into the at least one additional mode; the handoff signal for each of the at least one additional mode indicating to a subscriber station operating at the respective additional mode within the respective coverage area to switch from the respective additional mode to the first mode so that the subscriber station operates in the first mode.

28. (*cancelled*)

29. (*cancelled*)

30. A base station for use in a wireless communication system comprising:

a radio-transceiver for receiving and transmitting radio communications with respect to a plurality of subscriber stations;

data-processing equipment for carrying at least a portion of said communications over a backhaul; and

a device for performing handoff comprising an input device for receiving a handoff signal from said radio-transceiver at a first mode respective to a first coverage area of the communication system; an output device for delivering the handoff signal at a second mode respective to a second coverage area; a converter coupled to said input device and said output device for translating the handoff signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first mode.

31. The base station according to claim 30 wherein said base station is based on the CDMA protocol.

32. The base station according to claim 30 wherein the radio- transceiver is configured to receive and transmit radio communications with respect to the plurality of subscriber stations in the first mode.

33. (*cancelled*)

34. A handoff device for use in a wireless CDMA communication system and configured to be coupled to a radio-transceiver of a base station, the handoff device comprising an input device for receiving a CDMA re-direction signal from the radio-transceiver at a first frequency respective to a first coverage area of said communication system; a first converter connected to said input device for converting said CDMA re-direction signal from said first frequency to an intermediate frequency;

a second converter connected to said first converter for converting said CDMA re-direction signal from said intermediate frequency to a second frequency; an output device connected to said second converter for delivering said CDMA re-direction signal at said second frequency within a second coverage area; said CDMA re-directional signal for indicating to a subscriber station operating in said second frequency and within both of said coverage areas to switch from said second frequency to said first frequency.

35. A base station that incorporates the device according to claim 1.

36. The base station according to claim 35 wherein the base station further comprises a base station power combiner and a base station antenna coupled to said base station power combiner for transmitting radio communications to a plurality of subscriber stations; said output device further configured to transmit said handoff signal to said base station power combiner.

37. The base station according to claim 35 wherein said first coverage area and said second coverage area of said system are each based on a respective protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

38. The base station according to claim 37 wherein said protocols respective to said coverage areas are different.

39. The base station according to claim 35 wherein said handoff signal is a conventional CDMA re-direction signal.

40. The base station according to claim 39 wherein said base station is a first CDMA base station and said second coverage area is served by a second CDMA base station different from said first CDMA base station.

IX. 37 CFR §41.37 (c)(1)(ix) - Evidence Appendix

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(54) **METHOD AND SYSTEM OF HANDOFF**

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(52) **U.S. Cl.** **370/331**

(57) **ABSTRACT**

The present invention provides a novel method and system for effecting CDMA handoff transitions. In an embodiment, a converter is provided that converts a conventional CDMA trigger signal at a first frequency into the same handoff trigger signal but at second frequency. Where a subscriber station is operating in a coverage area at the second frequency, the received CDMA re-direction signal can be used to trigger the handoff of the subscriber station from the second frequency to the first frequency.

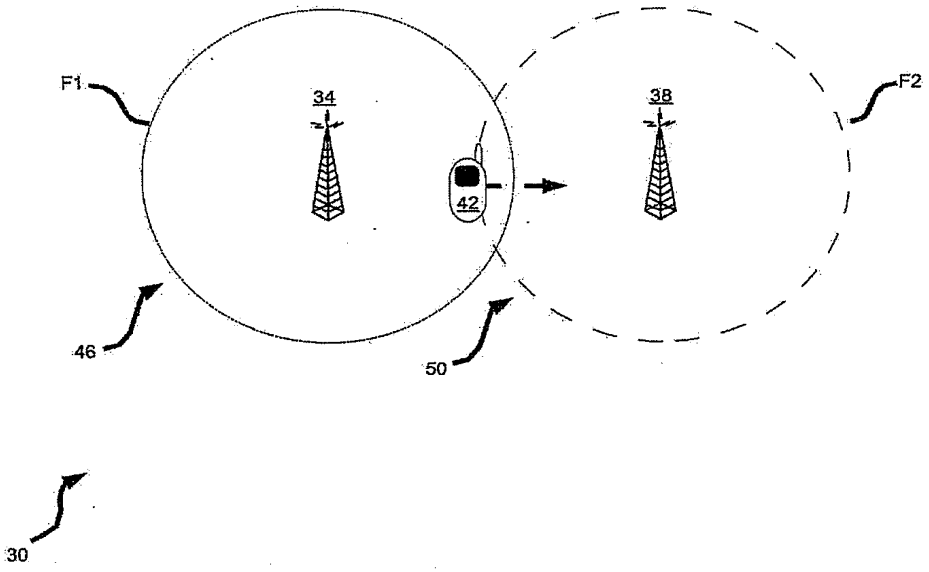
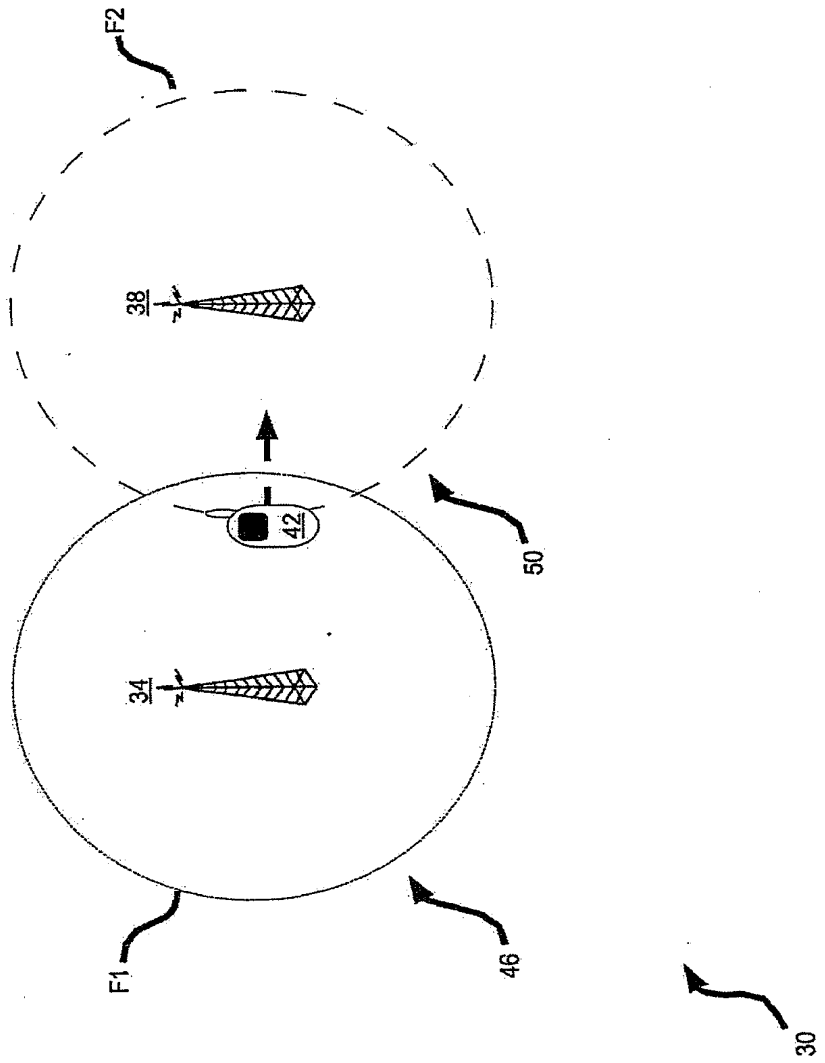


Fig. 1



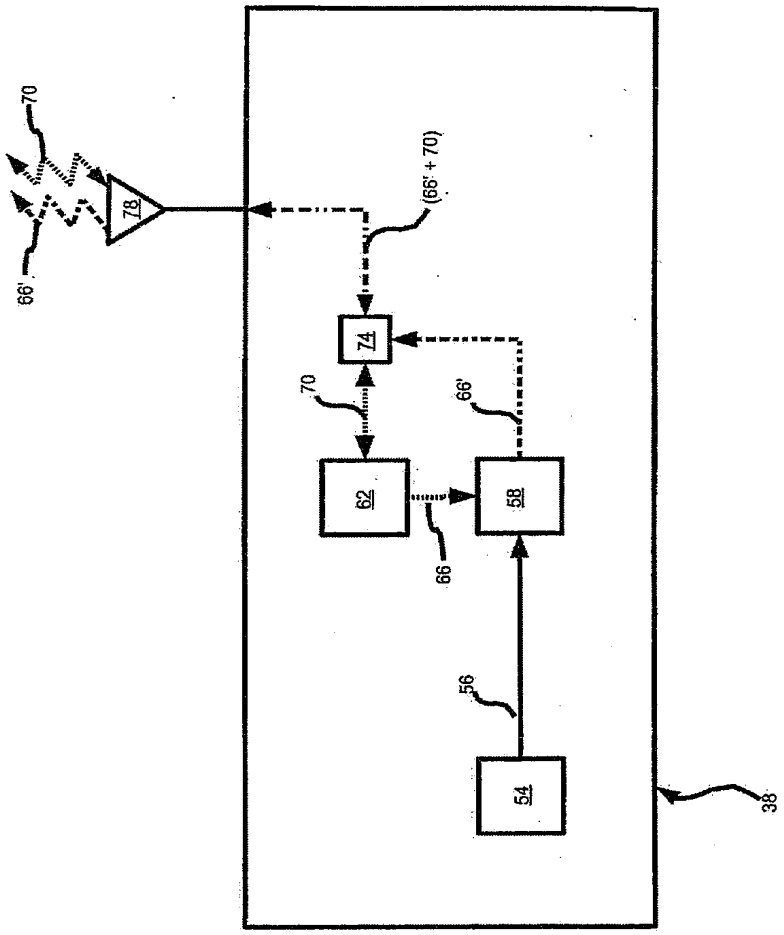


Fig. 2

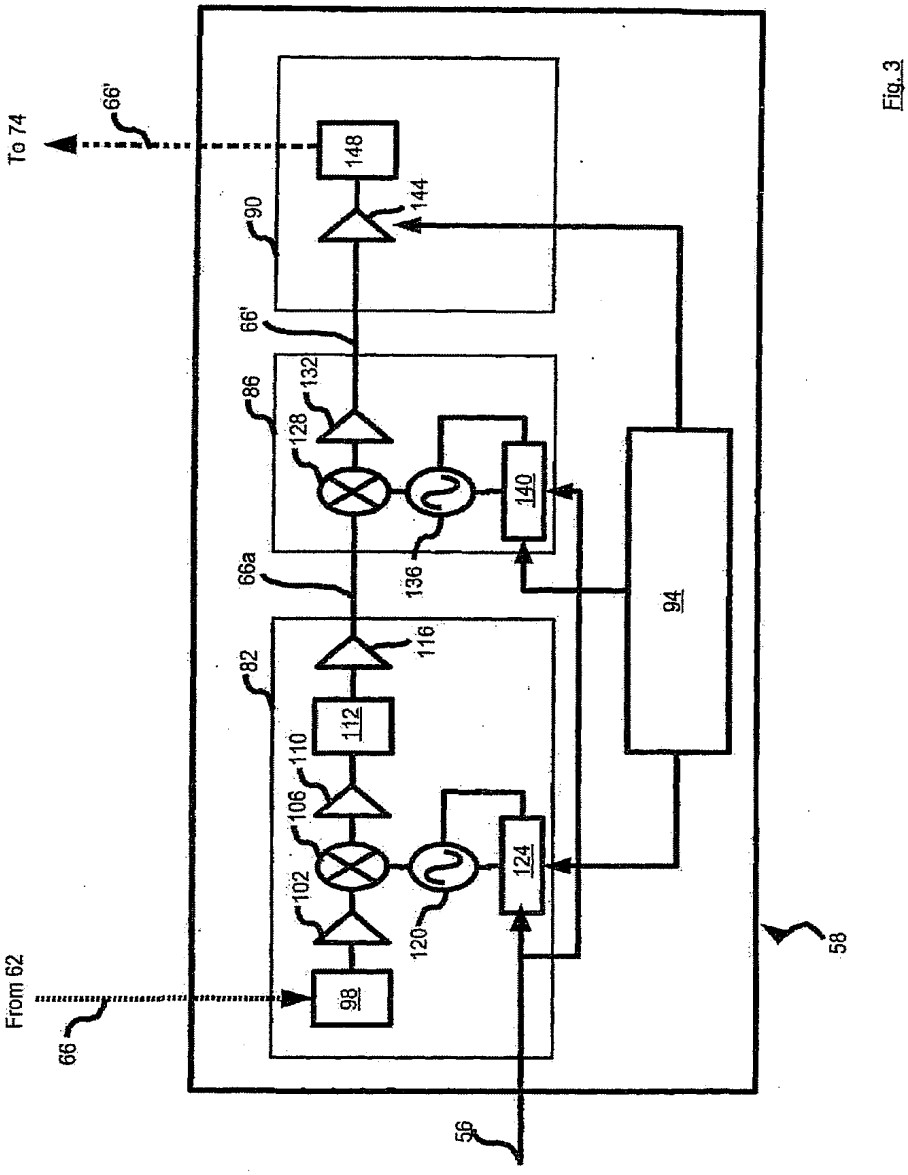

To 74
66'
148
144
90
66'
86
132
128
140
136
66a
116
82
112
110
106
102
124
120
98
From 62
66
94
58
56

Fig. 3

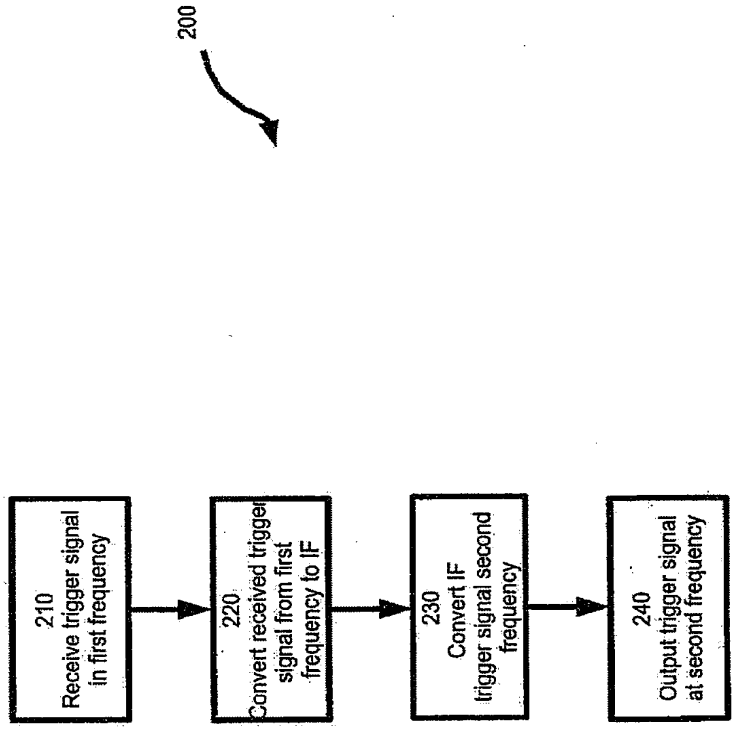

200
210
Receive trigger signal in first frequency
220
Convert received trigger signal from first frequency to IF
230
Convert IF trigger signal second frequency
240
Output trigger signal at second frequency

Fig. 4

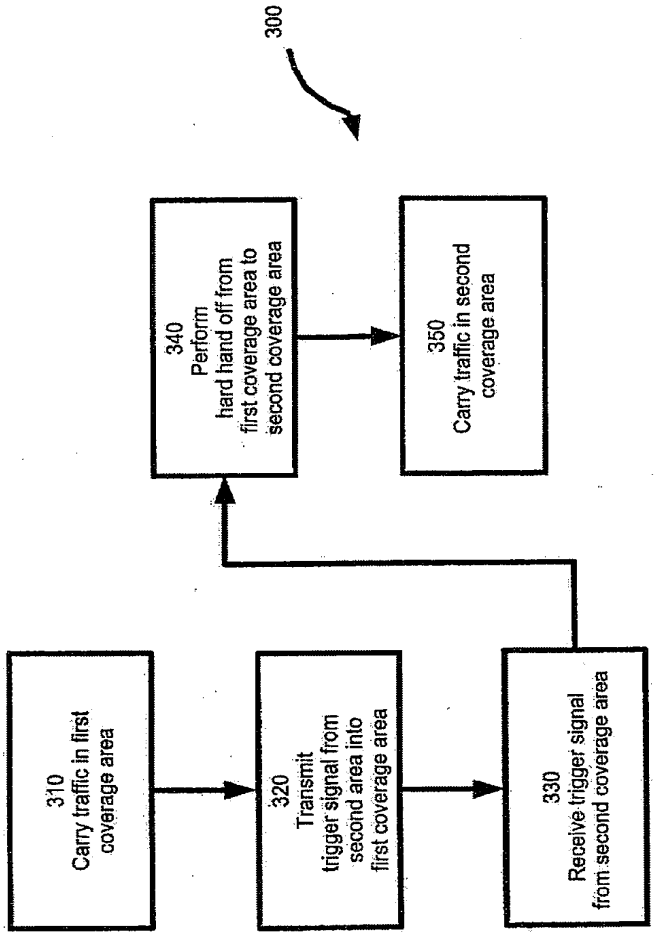

300
340
Perform
hard hand off from
first coverage area to
second coverage area
350
Carry traffic in second
coverage area
310
Carry traffic in first
coverage area
320
Transmit
trigger signal from
second area into
first coverage area
330
Receive trigger signal
from second coverage area

Fig. 5

Fig. 6

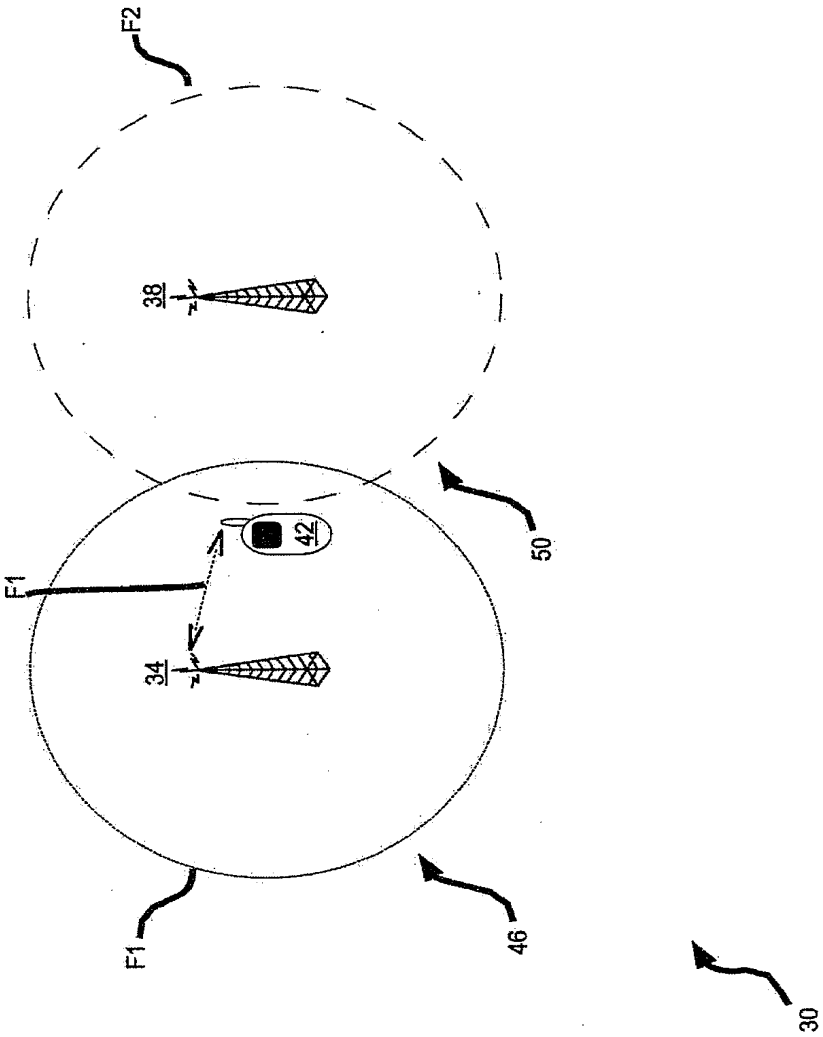


Fig. 7

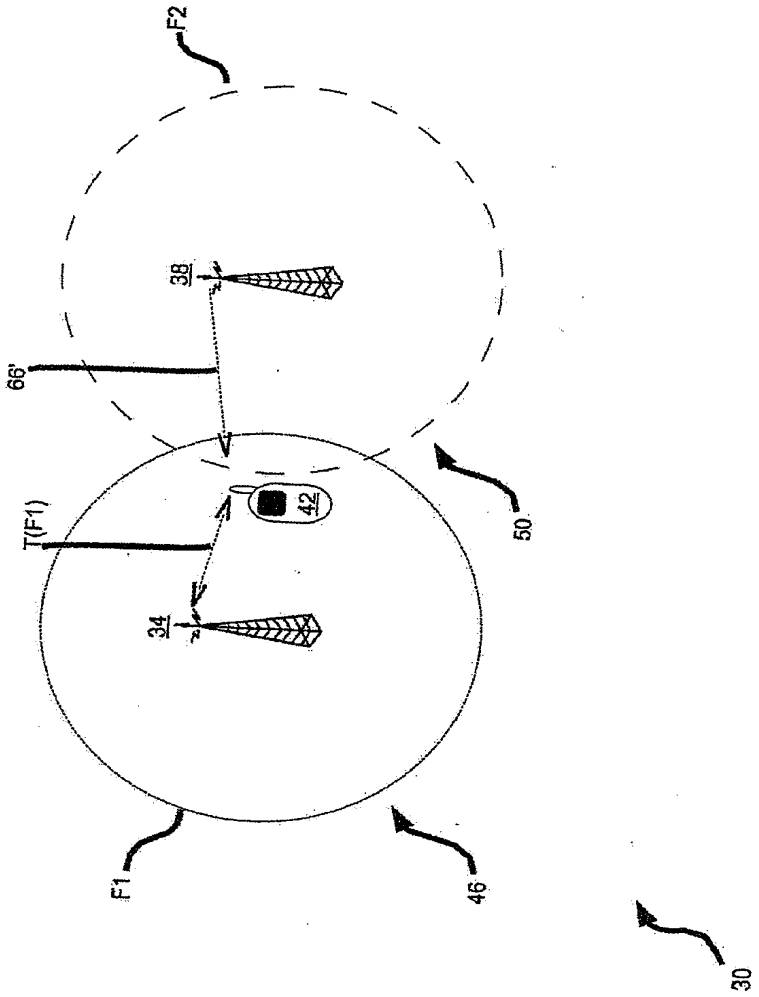


Fig. 8

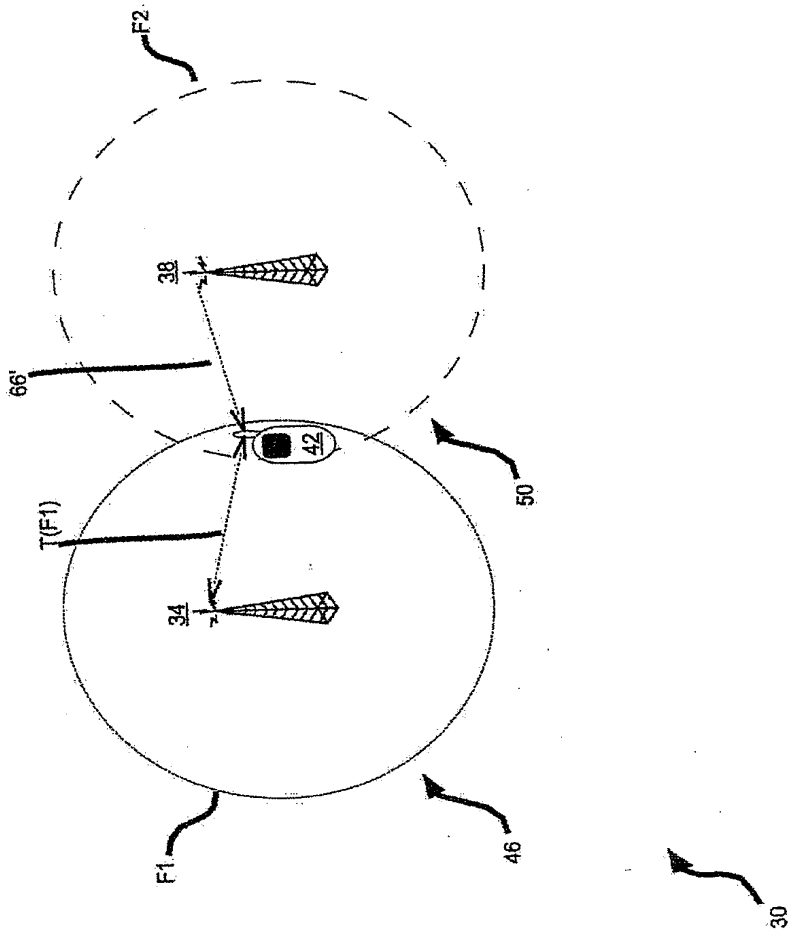
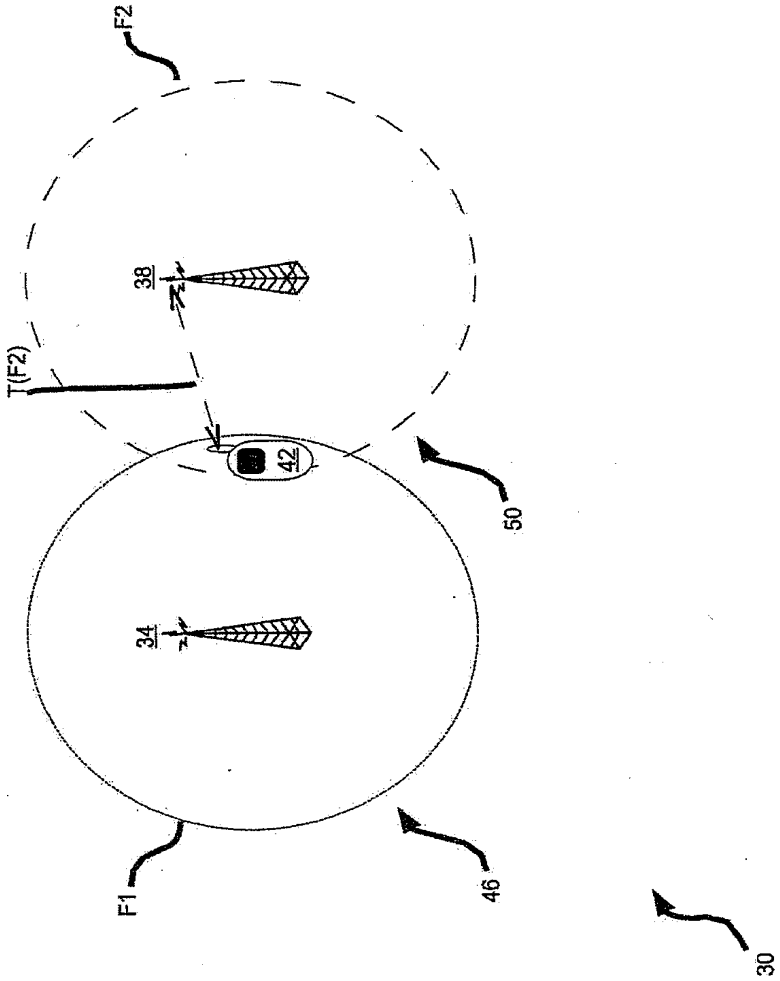


Fig. 9



METHOD AND SYSTEM OF HANDOFF

FIELD OF THE INVENTION

[0001] The present invention relates generally to telecommunications and more particularly to a method and system of handoff in a telecommunication system.

BACKGROUND OF THE INVENTION

[0002] As is well understood by those of skill in the art, the transferring of a subscriber station from one base station to another is termed handoff. In simple terms, handoff occurs when a subscriber station has to be handed off from one cell to another as the subscriber station moves between cells. Hard handoff refers to breaking the connection in a current cell and then making a new connection in the new cell. Hard handoff is also referred to as a "break-before-make" handoff. While Code Division Multiple Access ("CDMA") offers the opportunity to perform a "make-before-break" or "soft" handoff when adjacent CDMA cells all the same frequency, situations still occur in a CDMA system when a subscriber station will transition between cells that operate on different frequencies. Thus, CDMA systems that span multiple frequencies still require equipment to effect hard handoff.

[0003] There are several known methods of effecting hard handoff. One common method is by means of a round trip delay ("RTD") trigger. In simple terms, the RTD can be used to establish a distance between the subscriber station and the corresponding base station. Where the established distance indicates that the subscriber station is at the frequency edge, hard handoff is triggered. While RTD trigger is perhaps the most common method of effecting hard handoff it is not always reliable, and thus it is also known to use a pilot beacon trigger to effect hard handoff. Typically, a pilot beacon trigger can be used in both idle and traffic mode transitions, whereas RTD is used in traffic mode transitions only. When using a pilot beacon trigger, a radio frequency signal is transmitted on a pilot channel, that forces the subscriber station to transition to another frequency. Pilot beacon triggers can be effected with a pilot beacon unit, such as the Ericsson/Qualcomm QCPlus Pilot Beacon. Unfortunately, the QCPlus Pilot Beacon has been discontinued, and so it can be difficult to readily obtain a pilot beacon unit for to effect pilot beacon triggers. One way of effecting a pilot beacon trigger hard handoff without a pilot beacon unit is to use a channel element card in the base station radio that is enabled to transmit the appropriate radio frequency signal to force the subscriber station to transition to another frequency on hard handoff. In general, either of these solutions tend to be costly in a multi-carrier environment, such as that found in an urban centre like the Greater Toronto Area in Ontario, Canada.

[0004] Another method for effecting hard handoff is using a so-called Enhanced Hard Handoff, which is a hard handoff based on forward and reverse call statistic parameters such as frame-error-rate ("FER") or a received signal to noise ratio expressed as E_b/N_0. However, it is believed that pilot beacon triggered HHO mechanisms have proved to be generally reliable, whereas EHHO can be difficult to implement in the field, particularly in relation to pilot beacon triggered HHO.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to provide a novel method and system of handoff in a telecommunication system that obviates or mitigates at least one of the above-identified disadvantages of the prior art.

[0006] An aspect of the invention provides a device for use in a wireless communication system comprising an input device for receiving a handoff trigger signal at a first mode respective to a first coverage area of the communication system. The device also includes an output device for delivering the handoff signal at a second mode respective to a second coverage area. The device also includes a converter for translating the handoff trigger signal from the first mode into the second mode. The second mode handoff signal is directed to a subscriber station that is operating in the second mode at a location within both of the coverage areas. The second mode handoff signal notifies the subscriber station to switch from the second mode to the first mode so that the subscriber station operates in the first coverage area.

[0007] Typically, the device is used within a CDMA system. In this event, the first mode is typically a first frequency and the second mode is a second frequency. The device can be retrofitted into an existing base station located in the second coverage area, or into a pilot beacon trigger unit that is operating in the second mode. When retrofitted onto the existing base station, the handoff trigger signal generated by the existing base station at the second frequency is converted by the device into the same signal but now transmitted at the first frequency so it can be received by the subscriber station.

[0008] An aspect of the invention provides a device for use in a wireless communication system comprising: an input device for receiving a handoff trigger signal at a first mode respective to a first coverage area of the communication system and an output device for delivering the handoff signal at a second mode respective to a second coverage area. The device also includes a converter for translating the handoff trigger signal from the first mode into the second mode. The second mode handoff signal is for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first coverage area.

[0009] The first coverage area and the second coverage area of the system can be based on a protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

[0010] The protocols respective to each of the coverage areas can be different, but are typically the CDMA protocol wherein the handoff trigger signal is a conventional CDMA re-direction signal, and wherein the first mode is a first frequency and the second mode is a second frequency different from the first frequency. The first coverage area and the second coverage area are typically served by respective CDMA base stations. The device can be integral with one of the base stations.

[0011] The converter of the device can comprise a down-converter operable to receive the handoff trigger signal from the input device and for converting the handoff trigger from the first frequency to an intermediate frequency. The converter also includes an up-converter for converting the intermediate frequency to the second frequency. The device can also include a microcontroller operably connected to the down-converter and the up-converter such that the first

frequency and the second frequency is user-selectable. The microcontroller can be further operable to perform at least one of logging various conversions performed by the converter, and generating alarms if the converter operates outside of desired specifications.

[0012] Another aspect of the invention provides a method of generating a handoff trigger signal comprising the steps of:

[0013] receiving a trigger signal at a first mode respective to a first coverage area;

[0014] converting the trigger signal from the first mode to a second mode respective to a second coverage area; and,

[0015] outputting the trigger signal into the second coverage area.

[0016] Another aspect of the invention provides a system for performing handoff comprising: a first base station operating a first mode and operable to generate a handoff trigger signal at the first mode. The system also comprises a second base station operating a second mode, and a handoff device that includes an input device for receiving the handoff trigger signal at the first mode. The handoff device also includes an output device for delivering the handoff signal at the second mode in a coverage area respective to the second base station. The handoff device also includes a converter for translating the handoff trigger signal from the first mode into the second mode. The second mode handoff signal is for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode.

[0017] Another aspect of the invention provides a method of performing handoff of a subscriber station in a system that includes: a first base station operating a first mode and operable to generate a handoff trigger signal at the first mode; a second base station operating a second mode; a handoff device including an input device for receiving the handoff trigger signal at the first mode; an output device for delivering the handoff signal at the second mode in a coverage area respective to the base station; a converter for translating the handoff trigger signal from the first mode into the second mode The method comprises the steps of:

[0018] operating the subscriber station the second mode;

[0019] receiving, at the subscriber station, the second mode handoff signal;

[0020] switching the subscriber station from the second mode to the first mode based on the received second mode handoff signal.

[0021] Another aspect of the invention provides a handoff trigger signal delivered at a first mode within a first coverage area and receivable by a subscriber station operating at the first mode in the first coverage area, the handoff trigger signal is for indicating to the subscriber station to switch from the first mode to a second mode respective to a second coverage area, the handoff trigger signal having been generated by device operable to convert the handoff trigger signal from the second mode to the first mode.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The present invention will now be explained, by way of example only, with reference to certain embodiments and the attached Figures in which:

[0023] **FIG. 1** is a system for effecting handoff in accordance with an embodiment of the invention;

[0024] **FIG. 2** is a block diagram representing the enhanced base station in **FIG. 1**;

[0025] **FIG. 3** is a block diagram of the converter shown in **FIG. 2**;

[0026] **FIG. 4** shows a flow-chart depicting a method for generating a handoff trigger signal in accordance with another embodiment of the invention;

[0027] **FIG. 5** shows a method of effecting a handoff in accordance with another embodiment of the invention;

[0028] **FIG. 6** shows the system of **FIG. 1** and representing the performance of a step in the method of **FIG. 5**;

[0029] **FIG. 7** shows the system of **FIG. 1** and representing the performance of another step in the method of **FIG. 5**;

[0030] **FIG. 8** shows the system of **FIG. 1** and representing the performance of another step in the method of **FIG. 5**; and,

[0031] **FIG. 9** shows the system of **FIG. 1** and representing the performance of another step in the method of **FIG. 5**.

DESCRIPTION OF THE INVENTION

[0032] Referring now to **FIG. 1**, a system for effecting handoff is indicated generally at **30**. System **30** is comprised of at least two base stations **34** and **38** that are operating at different frequencies F1 and F2 such that a hard handoff is required when a subscriber station **42** moves from a coverage area **46** respective to base station **34** into a coverage area **50** respective to base station **38**. It is to be understood that base stations **34** and **38** can actually represent a base station sector, and, in perhaps less common circumstances, base stations **34** and **38** can be two adjacent sector respective to a single base station.

[0033] In a present embodiment, system **30** is based on a CDMA standard, such as IS-95, J-STD-008 or CDMA 2000. Thus it is to be noted that, while dashed-lines are used to represent the different frequencies F1 and F2 of each base station **34** and **38**, each base station **34** is in fact emitting a plurality of different channels within its coverage area that correspond to the CDMA standard being implemented, and thus each coverage area **46** and **50** reflects emitted traffic channels, pilot channels and the like from the respective base station **34** and **38**. Further details on the emitted channels will be discussed in greater detail below.

[0034] In a present embodiment, base station **34** is a conventional CDMA base station familiar to those of skill in the art, while base station **38** is novel and enhanced base station.

[0035] Referring now to **FIG. 2**, a more detailed view of enhanced base station **38** is shown. Base station **38** includes a clock **54** which provides a clock signal input **56** to a converter **58**. Because base station **38** is based on CDMA, clock **54** is typically a global positioning system ("GPS") receiver designed to provide a clock signal that allows converter **58** to synchronize itself with base station **34**. Base station **38** also includes a radio **62**, which in the present

embodiment is a conventional CDMA base station radio. Radio **62** thus also generates a handoff trigger signal **66** at frequency F1. Handoff trigger **66** generated by radio **62** is thus also received by converter **58**. (In a present embodiment, trigger signal **66** is simply a conventional CDMA signal, but it is to be understood that handoff signal **66** can be other types of signals depending on the particular system and in which the present embodiment is modified for deployment.) Where radio **62** is a conventional CMDA base station radio, as in the present embodiment, handoff trigger signal **66** can be obtained from a test output port on the radio as is found on many existing models of CMDA base station radios.

[0036] Radio **62** also transmits and receives its conventional CDMA signals **70**, as are normally produced by radio **62**, and therefore include traffic channels, pilot channel, etc.

[0037] Converter **58** is operable to convert handoff trigger signal **66** at frequency F1 into a converted handoff trigger signal **66'**, which is outputted from converter **58**. Converted handoff trigger signal **66'** and conventional CDMA signals **70** are thus combined at a power combiner **74**, and then delivered to a base station antenna **78**. Advantageously, base station antenna **78** can be simply the pre-existing antenna **78** already associated with base station **38**. Base station antenna **78** thus transmits converted handoff trigger signal **66'**.

[0038] In general, it should now be apparent that, in the present embodiment, enhanced base station **38** is simply a conventional CDMA base station **38** that has been retrofitted to include converter **58** and the appropriate connections thereto.

[0039] Referring now to **FIG. 3**, converter **58** is shown in greater detail. Converter **58** comprises a down-converter **82**, an up-converter **86**, a power amplifier **90** and a microcontroller **94**. Down-converter **82** is operable to receive handoff trigger signal **66** and convert it down to an intermediate frequency ("IF") handoff signal **66*a***. In the present embodiment, down-converter **82** comprises a first bandpass filter **98**, a first amplifier **102**, a first mixer **106**, a second amplifier **110**, a second bandpass filter **112**, and a third amplifier **116**. The foregoing components (i.e. filter **98**, amplifier **102**, amplifier **110**, bandpass filter **112**, and amplifier **116**) cooperate to convert handoff trigger signal **66** into intermediate handoff signal **66*a***. Down-converter **82** also includes an oscillator **120** and a phase locked loop **124**. Phase locked loop **124** receives clock signal **56** and an input from microcontroller **94** instructing phase locked loop **124** as to the frequency (i.e. frequency F1) of handoff trigger signal **66**. In turn, phase locked loop **124** via its connection through oscillator **120** connect to mixer **106**, thereby providing the information needed to convert handoff trigger signal **66** and convert it down to an IF handoff signal **66*a***.

[0040] Up-converter **86** comprises a mixer **128**, an amplifier **132**, an oscillator **136** and a phase locked loop **140**. Phase locked loop **140** is connected to microcontroller **94** to receive instructions as to which frequency that IF handoff trigger signal **66*a*** is to be converted to (in this example, frequency F1). Thus, mixer **128** also receives IF handoff trigger signal **66*a*** and mixes that signal with the input from oscillator **136**. Amplifier **132** receives the output from mixer **128** thus ultimately converting IF signal **66*a*** to CDMA re-direction signal **66'**.

[0041] Both down-converter **82** and up-converter **86** ultimately use clock signal **56** to ensure that signal **66'** is synchronized with base stations **34** and radio **62**, as is common in CDMA systems.

[0042] Power amplifier **90** comprises an amplifier **144** and bandpass filter **148** to ultimately increase the power of signal **66'**, and thus converter **58** finally outputs signal **66'** for delivery to power combiner **74**.

[0043] Microcontroller **94**, (which can be optional where the original frequency F2 and target frequency F1 are fixed), is thus typically connectable to a microcomputer (not shown), which allows a user to program microcontroller **94** as to which frequencies converter **58** is to operate with, and to indicate the level of gain to be used by amplifier **144**. Microcontroller **94** also typically includes software and hardware to allow for logging of the operation of converter **58**, and/or to generate alarms if certain events occur during the operation of converter **58** such as: the phase lock loops **124** and **140** losing their lock; the power is faulty in the power amplifier **90**; the entire converter **58** fails to activate; the power supply used to power converter **58** is faulty; the temperature of converter **58** is outside safe operating ranges; the gain of amplifier **144** is out of range. Other alarms will occur to those of skill in the art. Such alarms can be delivered via a connector on microcontroller **94** (not shown) to a location remote from base station **38** so that a service technician can be called in to effect necessary repairs.

[0044] Referring now to **FIG. 4**, a method for generating a handoff trigger signal is indicated generally at **200**. In order to assist in the explanation of the method, it will be assumed that method **200** is operated using converter **58**. Furthermore, the following discussion of method **200** lead to further understanding of converter **58**. (However, it is to be understood that converter **58** and/or method **200** can be varied, and need not work exactly as discussed herein in conjunction with each other, and that such variations are within the scope of the present invention.)

[0045] Beginning at step **210**, a trigger signal at a first frequency is received. In converter **58**, this occurs as trigger signal **66** originating from radio **62** is received at bandpass filter **98** of down converter **82**. Next, at step **220**, the received trigger signal is converted to base band signal. When implemented in converter **58**, this step is performed by down converter **82**, which processes CDMA signal **66** through the above-described components to generate an intermediate frequency CDMA signal **66*a***. Next, at step **230**, the intermediate frequency CDMA signal is converted to the second frequency. When implemented in converter **58**, this step is performed by up converter **86**, which processes CDMA signal **66*a*** through the above-described components to generate a converted CDMA re-direction signal **66'**. Next, at step **240**, the CDMA re-direction signal generated at step **230** is outputted. When implemented in converter **58**, this step is performed at least in part by power amplifier **90** which boosts the power of trigger signal **66'** to a desired level, before finally outputting signal **66'** from converter **58** and delivering it to power combiner **74**.

[0046] Referring now to **FIG. 5**, a method for effecting traffic mode hard handoff is indicated generally at **300**. In order to assist in the explanation of the method, it will be assumed that method **300** is operated using system **30**. Furthermore, the following discussion of method **300** lead to

further understanding of system **30**. (However, it is to be understood that system **30** and/or method **300** can be varied, and need not work exactly as discussed herein in conjunction with each other, and that such variations are within the scope of the present invention.)

[0047] Method **300** is assumed to be performed while subscriber station **42** is operating within coverage area **46** in traffic mode. It is assumed that subscriber station **42** is operating at frequency F1 and is communicating with base station **34**. It is further assumed that subscriber station **42** is located proximal to the intersection of coverage areas **46** and **50**, and therefore just within range of base station **38**. It is further assumed that subscriber station **42** is moving towards the outer periphery of coverage area **46**, away from base station **34**, and ultimately moving further towards the centre of coverage area **50**.

[0048] At step **310**, traffic is carried in a first coverage area. Step **310** is represented in **FIG. 6**, where subscriber station **42** is located in coverage area **46**, and is conducting a voice call (i.e. traffic) by means of a traffic channel established between subscriber station **42** and base station **34**. The voice call in **FIG. 7** is represented by reference T(F1), to indicate traffic being conducted at frequency F1.

[0049] At step **320**, a trigger signal is transmitted from a second coverage area into the first coverage area (Step **320** is typically occurring on a continuous basis, and so it need not be construed that step **320** will only occur after step **310** has occurred.) Step **310** is represented in **FIG. 7**, wherein enhanced base station **38** is carrying on its own traffic with other subscriber stations (not shown) within coverage area **50** at frequency F2, while simultaneously transmitting CDMA re-direction signal **66'** at frequency F1. Step **310** can be performed using method **200**, or the like.

[0050] At step **330**, the handoff signal from the second coverage area is received in the first coverage area. Step **330** is represented in **FIG. 8**, where subscriber station **42** is shown as having moved into a region where coverage areas **46** and **50** overlap. Thus, at this point, while subscriber station **42** is communicating its voice call T(F1) with base station **34**, it is also receiving beacon trigger signal **66'** from base station **38**, which is also being carried at frequency F1 and is therefore receivable by subscriber station **42** which is currently operating frequency F1 as it communicates with base station **38**.

[0051] At step **340**, hard handoff from the first coverage area (F1) to the second coverage area is effected (F2). In the present embodiment, now that the trigger for the hard handoff has been completed, the actual hard handoff effected at step **340** is, at this point, performed in substantially the same manner as a prior art pilot beacon triggered HHO, such as would occur in a system simply utilizing a pilot beacon unit, such as the Ericsson/Qualcomm QCPlus Pilot Beacon. Accordingly, the connection between subscriber station **42** and base station **34** is broken and re-established with base station **38** in the usual manner on F2.

[0052] At step **350**, traffic is carried in the second coverage area on F2. Step **350** is represented in **FIG. 9**, where subscriber station **42** is located in coverage area **50**, and is conducting a voice call (i.e. traffic) by means of a traffic channel established between subscriber station **42** and base station **34**. The voice call in **FIG. 9** is represented by reference T(F2), to indicate traffic being conducted at frequency F2.

[0053] Of particular note about method **300**, since the handoff described therein is conducted in traffic mode, then the handoff describe therein typically consists of a pilot beacon triggered hard handoff, and thus, handoff signal **66'** is carried over the CDMA channels respective to that type of handoff.

[0054] However, it is also contemplated that the present invention is applicable to handoffs that occur in idle mode. In this event, the trigger signal is carried over the appropriate CDMA channel that is respective to that type of handoff. In particular, it is contemplated that the CDMA Channel List Message (carried over the paging channel) would be used to redirect subscriber station **42** from base station **34** to base station **38**.

[0055] It is also to be noted that, while system **30** shows two adjacent coverage areas **46** and **50**, the embodiments herein can be modified to manage handoffs where there are a plurality of adjacent coverage areas that are operating at different frequencies. Furthermore, where such a plurality of adjacent coverage areas occur yet the overlap of such coverage areas includes coverage areas that belong to different service providers, the embodiment herein can be modified to ensure that the subscriber station in question transitions to from one coverage area to another coverage that both belong to the same service provider.

[0056] While only specific combinations of the various features and components of the present invention have been discussed herein, it will be apparent to those of skill in the art that desired subsets of the disclosed features and components and/or alternative combinations of these features and components can be utilized, as desired. For example, while system **30** is primarily directed to carying voice signals, in other embodiments system **30** and its components can be varied to carry other types of signals, such as data signals, or voice over IP signals and/or combinations thereof. For example, system **30** can be modified to work with GSM, FDMA, TDMA, GPRS AMPSor other wireless protocols

[0057] Also, while subscriber station **42** is a standard CDMA mobile handset, in other embodiments could also be a nomadic wireless subscriber station **42** capable of carrying voice and/or data, such as may be found in a fixed wireless system or wireless local loop.

[0058] Also, while converter **58** and method **200** discuss converting a first frequency to an intermediate frequency and then to a second frequency, it is contemplated that in other embodiments converter **58** can be configured to simply convert the first frequency directly to the second frequency. This could be particularly use ful where the first frequency and second frequency are fixed, and therefore converter **58** need not be capable of dynamic adjustment as to the frequencies in which it will operate.

[0059] Furthermore, while in system **30** described above radio **62** is a conventional CDMA base station radio, in other embodiments radio **62** can simply be pilot beacon unit, such as the Ericsson/Qualcomm QCPlus Pilot Beacon. Where radio **62** is a pilot beacon unit, however, it will be understood that base station **38** is no longer acting as a base station, but merely as a unit for use in effecting hard handoff between other adjacent base stations operating at different frequencies.

[0060] It should also be understood that while converter **58** in enhanced base station **38** is shown to generate a single copy of trigger signal **66** as, in the present embodiment of system **30**, a conventional CDMA re-direction signal **66'**, in other embodiment converter **58** can be configured to create multiple copies of CDMA signal **66**, which can be particularly useful where converter **58** is operating at a boundary of multiple frequencies. In this case, a copy of CDMA signal **66** would be presented for each of the frequencies at the boundary, to encourage a hard handoff from one of those frequencies to the frequency of the original CDMA signal **66**.

[0061] The above-described embodiments of the invention are intended to be examples of the present invention and alterations and modifications may be effected thereto, by those of skill in the art, without departing from the scope of the invention which is defined solely by the claims appended hereto.

1. A device for use in a wireless communication system comprising:

an input device for receiving a handoff trigger signal at a first mode respective to a first coverage area of the communication system; an output device for delivering the handoff signal at a second mode respective to a second coverage area; a converter for translating the handoff trigger signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first coverage area.

2. The device according to claim **1** wherein said first coverage area and said second coverage area of said system are based on a protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

3. The device according to claim **3** wherein said protocols respective to said coverage areas are different.

4. The device according to claim **1** wherein said handoff trigger signal is a conventional CDMA re-direction signal, and wherein said first mode is a first frequency and said second mode is a second frequency different from said first frequency.

5. The device according to claim **4** wherein said first coverage area and said second coverage area are served by respective CDMA base stations.

6. The device according to claim **5** wherein said device is integral with one of said base stations.

7. The device according to claim **4** wherein said converter comprises a down-converter operable to receive said handoff trigger signal from said input device and for converting said handoff trigger from said first frequency to an intermediate frequency and an up-converter for converting said intermediate frequency to said second frequency.

8. The device according to claim **7** further comprising a microcontroller operably connected to said down-converter and said up-converter such that said first frequency and said second frequency is user-selectable.

9. The device according to claim **9** wherein said microcontroller is further operable to perform at least one of logging various conversions performed by said converter, and generating alarms if said converter operates outside of desired specifications.

10. A method of generating a handoff trigger signal comprising the steps of:

receiving a trigger signal at a first mode respective to a first coverage area;

converting said trigger signal from said first mode to a second mode respective to a second coverage area; and,

outputting said trigger signal into said second coverage area.

11. The method according to claim **10** wherein said first coverage area and said second coverage area are based on a protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

12. The method according to claim **11** wherein said protocols respective to said coverage areas are different.

13. The method according to claim **10** wherein said handoff trigger signal is a conventional CDMA re-direction signal, and wherein said first mode is a first frequency and said second mode is a second frequency different from said first frequency.

14. The method according to claim **13** wherein said first coverage area and said second coverage area are served by respective CDMA base stations.

15. The method according to claim **14** wherein said device is integral with one of said base stations.

16. The method according to claim **13** further comprising the step of receiving an input signal identifying at least one said frequencies for use in performing the remainder of the steps.

17. A system for performing handoff comprising:

a first base station operating a first mode and operable to generate a handoff trigger signal at said first mode;

a second base station operating a second mode;

a handoff device including an input device for receiving said handoff trigger signal at said first mode; an output device for delivering said handoff signal at said second mode in a coverage area respective to said second base station; a converter for translating the handoff trigger signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode.

18. The system according to claim **17** wherein said first base station and said second base station of said system are based on a protocol selected from the group consisting of CDMA, TDMA, GSM, GPRS, AMPS and FDMA.

19. The system according to claim **18** wherein said protocols respective to said coverage areas are different.

20. The system according to claim **17** wherein said handoff trigger signal is a conventional CDMA re-direction signal, and wherein said first mode is a first frequency and said second mode is a second frequency different from said first frequency.

21. The system according to claim **17** wherein said handoff device is integral with said first base station.

22. The system according to claim **20** wherein said converter comprises a down-converter operable to receive said handoff trigger signal from said input device and for converting said handoff trigger from said first frequency to an intermediate frequency and an up-converter for converting said intermediate frequency to said second frequency.

23. The system according to claim 22 further comprising a microcontroller operably connected to said down-converter and said up-converter such that said first frequency and said second frequency is user-selectable.

24. The system according to claim 23 wherein said microcontroller is further operable to perform at least one of logging various conversions performed by said converter, and generating alarms if said converter operates outside of desired specifications.

25. A method of performing handoff of a subscriber station in a system that includes: a first base station operating a first mode and operable to generate a handoff trigger signal at said first mode; a second base station operating a second mode; a handoff device including an input device for receiving said handoff trigger signal at said first mode; an output device for delivering said handoff signal at said second mode in a coverage area respective to said base station; a converter for translating the handoff trigger signal from the first mode into the second mode, said method comprising the steps of:

operating said subscriber station said second mode;

receiving, at said subscriber station, said second mode handoff signal;

switching said subscriber station from said second mode to said first mode based on said received second mode handoff signal.

26. A handoff trigger signal delivered at a first mode within a first coverage area and receivable by a subscriber station operating at said first mode in said first coverage area, said handoff trigger signal for indicating to said subscriber station to switch from said first mode to a second mode respective to a second coverage area, said handoff trigger signal having been generated by device operable to convert said handoff trigger signal from said second mode to said first mode.

27. A device for use in a wireless communication system comprising:

an input device for receiving a handoff trigger signal at a first mode respective to a first coverage area of the communication system; an output device for delivering the handoff signal at least one additional mode respective to at least one additional coverage area; a converter for translating the handoff trigger signal from the first mode into the additional mode; the additional mode handoff signal for indicating to a subscriber station operating in the additional mode within the coverage areas to switch from the additional mode to the first mode so that the subscriber station operates in the first coverage area.

28. A method for performing handoff comprising the steps of:

receiving a CDMA handoff signal at a first frequency;

converting said received signal from said first frequency to an intermediate frequency;

converting said intermediate frequency trigger signal to a second frequency; and,

outputting said signal at said second frequency.

29. A device for performing handoff comprising:

means for receiving a CDMA handoff signal at a first frequency;

means for converting said received signal from said first frequency to an intermediate frequency;

means for converting said intermediate frequency trigger signal to a second frequency; and,

means for outputting said signal at said second frequency.

30. A base station for use in a wireless communication system comprising a radio-transceiver for receiving and transmitting radio communications to a plurality of subscriber stations, data-processing equipment for carrying at least a portion of said communications over a backhaul, said base station further including a device for performing handoff comprising an input device for receiving a handoff trigger signal at a first mode respective to a first coverage area of the communication system; an output device for delivering the handoff signal at a second mode respective to a second coverage area; a converter for translating the handoff trigger signal from the first mode into the second mode; the second mode handoff signal for indicating to a subscriber station operating in the second mode within both of the coverage areas to switch from the second mode to the first mode so that the subscriber station operates in the first coverage area.

31. The base station according to claim 30 wherein said base station is based on the CDMA protocol.

32. The base station according to claim 30 wherein the radio-transceiver is operable to receive and transmit radio communications to the plurality of subscriber stations in the first mode.

33. The base station according to claim 30 further comprising a handoff trigger generator for generating the handoff trigger signal.

34. A handoff device for use in a wireless CDMA communication system comprising an input device for receiving a CDMA re-direction signal at a first frequency respective to a first coverage area of said communication system; a first converter connected to said input device for converting said CDMA re-direction signal from said first frequency to an intermediate frequency; a second converter connected to said first converter for converting said CDMA re-direction signal from said intermediate frequency to a second frequency; an output device connected to said second converter for delivering said CDMA re-direction signal at said second frequency within a second coverage area; said CDMA re-directional signal for indicating to a subscriber station operating in said second frequency and within both of said coverage areas to switch from said second frequency to said first frequency so that said subscriber station operates in said first coverage area.

* * * * *

X. 37 CFR §41.37 (c)(1)(x) - Related Proceedings Appendix

None.

CONCLUSION

It is believed that claims 1-24, 27, 30-32 and 34-40 are in condition for allowance. The Notice of Allowance is earnestly solicited.

Respectfully submitted,

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